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HANDBOOK
FIELD MAINTENANCE INSTRUCTIONS

RADIO SET
AN/ARC-21

(RCA)

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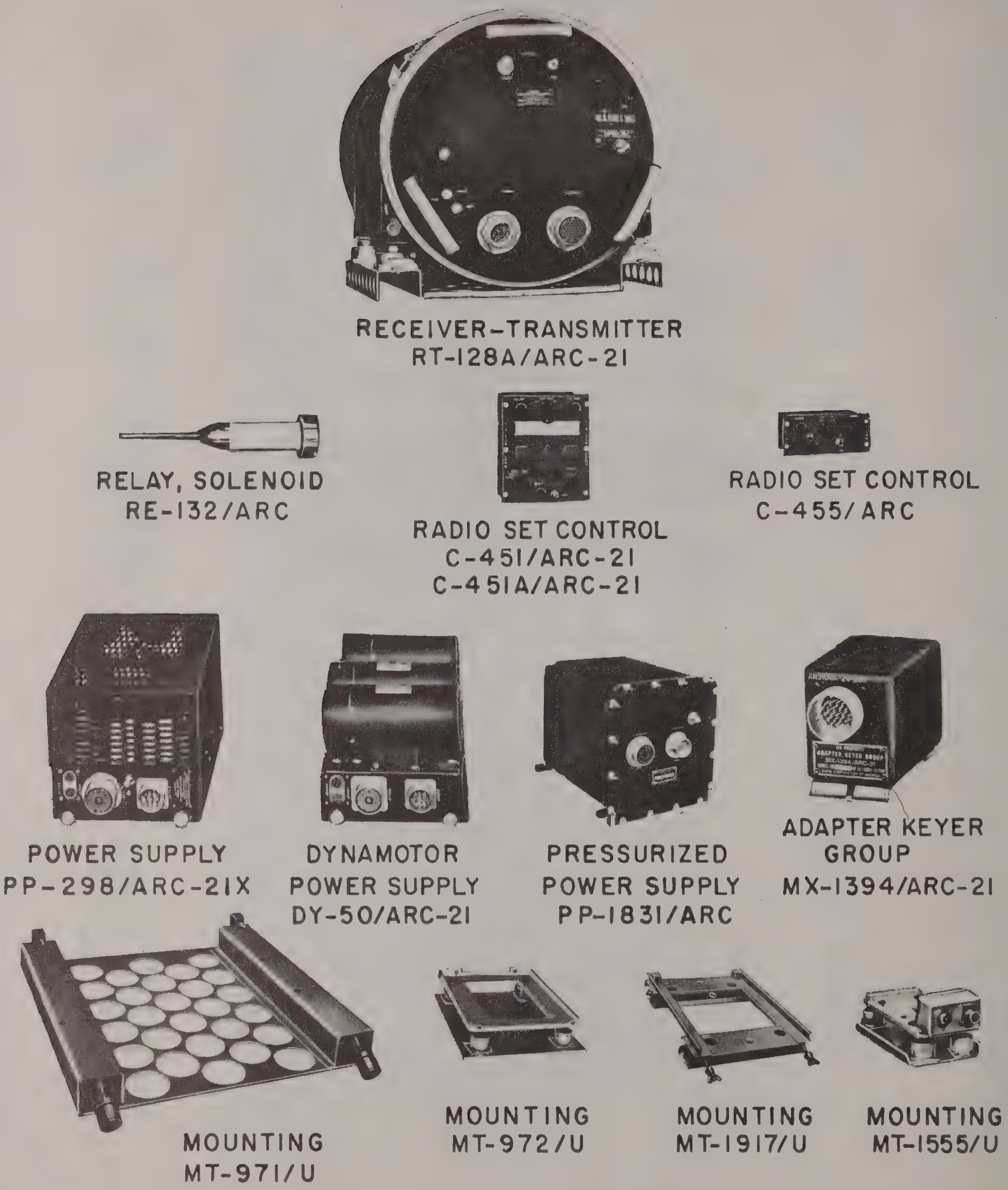
INTRODUCTION

This handbook comprises field maintenance instructions for Radio Set AN/ARC-21.

Schematic and wiring diagrams of the various components have been reproduced from the manufacturer's drawings. All drawing symbols are explained and illustrated in Section VI of the handbook.

Most of the abbreviations used in this handbook are listed in ANA Bulletin 261. Those that are not are explained in the text the first time they are used.


RECEIVER-TRANSMITTER
RT-128A/ARC-21
RELAY, SOLENOID
RE-132/ARC
RADIO SET CONTROL
C-451/ARC-21
C-451A/ARC-21
RADIO SET CONTROL
C-455/ARC
POWER SUPPLY
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DY-50/ARC-21
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POWER SUPPLY
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ADAPTER KEYER
GROUP
MX-1394/ARC-21
MOUNTING
MT-971/U
MOUNTING
MT-972/U
MOUNTING
MT-1917/U
MOUNTING
MT-1555/U

Figure 1-1. Radio Set AN/ARC-21

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. SCOPE.

Note

> No transmission will be made on the international distress frequency of 8364 kc except in actual emergencies. For testing, demonstrations, or drill purposes, radio equipment must be operated into a nonradiating dummy load instead of an antenna to prevent transmission of false distress signals.

1-2. This publication comprises field maintenance instructions for Radio Set AN/ARC-21, manufactured by Radio Corporation of America, Defense Electronic Products, Camden, New Jersey. It contains all the information for field maintenance personnel to repair the equipment from a worn, damaged, or improperly functioning condition to a fully operable condition. All data required for the performance of check-outs, repairs, replacements, adjustments, recalibration and preparation for reshipment is supplied in this handbook.

1-3. EQUIPMENT LIST.

1-4. Listed in table I are the items supplied for Radio Set AN/ARC-21.

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-6. Refer to table II for a list of equipment required but not supplied for Radio Set AN/ARC-21.

1-7. PURPOSE AND USE.

1-8. Radio Set AN/ARC-21 permits long-range voice or cw communication from aircraft to aircraft or ground. Facilities also provide teletype operation with the addition of a teletypewriter and frequency shift keying adaptor. The frequency range is from 2 to 23.9995 megacycles in 500-cycle steps, giving a total of 44,000 available frequencies. Any 20 of the 44,000 frequencies can be set up at the Radio Set Control C-451A/ARC-21 and then switch-selected as desired during use.

1-9. Tune-up of the receiver on a newly selected channel is automatically completed in a few seconds. Transmitter tune-up is completed the first time the key or "push-to-talk" button is pressed after changing channels. The equipment is easy to operate, since all tuning and loading is done electronically. Pre-setting the 20 channels is readily accomplished, requiring only a small tool located inside one of the covers of the channel setting drums. No conversion charts or codes are required for pre-setting the channels, since the markings for the frequency determining buttons indicate frequencies directly.

1-10. Since this equipment was designed entirely for remote, automatic tuning, there are no provisions for manual tuning either during operating periods or maintenance periods. There are provisions for mcw operation.

1-11. Audio input and output for the equipment are obtained through the AN/AIC-10 interphone system, utilizing the same headphones and microphone for reception and transmission as are used for intercommunication in the aircraft.

1-12. COMPONENT DESCRIPTION.

1-13. RECEIVER-TRANSMITTER RT-128A/ARC-21. Receiver-Transmitter RT-128A/ARC-21 is mounted in a sealed cylindrical heat exchanger which makes up the case. Included in the case are two blowers to facilitate heat dissipation up to altitudes of 50,000 feet. The inner blower runs at constant speed to circulate the air within the heat exchanger. As the altitude is increased, the outside blower increases speed to keep a constant quantity of air flowing through the cooling fins. Mounted on the main frame are 10 plug-in chassis for frequency determining, receiver, transmitter, and control circuits. Receiver-Transmitter RT-128A/ARC-21 is completely remote-controlled and can be mounted at any convenient location in the aircraft relative to the aircraft cabling for the Radio Set AN/ARC-21. Mounting MT-971/U provides shock protected support and permits easy removal of the unit.

1-14. RADIO SET CONTROL C-451A/ARC-21. (See figures 1-2 and 1-3.) This unit provides facilities for presetting 20 of the 44,000 available frequencies, and for permitting complete control and operation of the equipment. Functions of operating controls are given in table VII. (See paragraph 1-38.) The number of the channel in use is visible through an illuminated window, together with the numbers of the preceding and succeeding channels. In the center of the panel are two covers, held closed by thumb screws, which enclose the drums on which the desired frequencies are preset. A matte-surfaced plastic sheet for recording the preset channels is mounted on the top cover.

1-15. RADIO SET CONTROL C-455/ARC. (See figure 1-4.) In addition to Radio Set Control C-451A/ARC-21, up to five Radio Set Controls C-455/ARC may be used to control the equipment from different locations. These accessory control units provide the following controls for voice operation only: "VOLUME", "NOISE", "CONTROL" (take control, and turn on or off), "CHANNEL" and "POWER" (transmitter power) controls. The functions are similar to those at the same controls on Radio Set Control C-451A/ARC-21. Illumination is provided by two pilot lights connected through a brilliance control (not supplied). No provision for setting up the channels is incorporated.

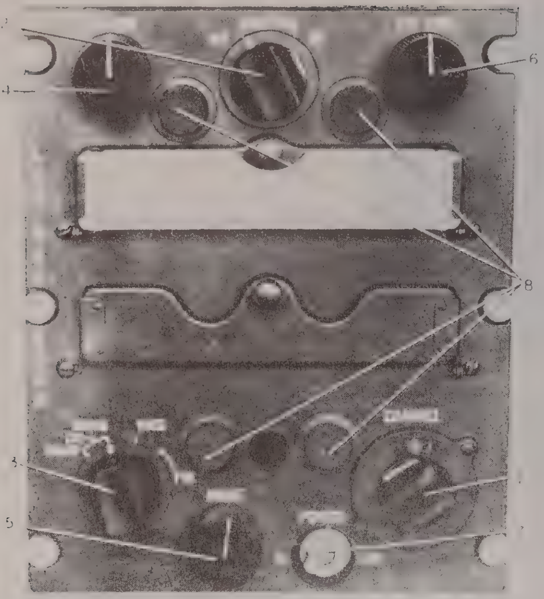


Figure 1-2. Radio Set Control C-451A/ARC-21, Operating Controls (See table VII.)

1-16. POWER SUPPLY PP-298/ARC-21X. This power supply is mounted on Mounting MT-972/U, from which it is readily removed for servicing. Located at a convenient place in the aircraft, within reasonable distance of Receiver-Transmitter RT-128A/ARC-21, this power supply is used when the aircraft has both 27.5-volt d-c and 115-volt a-c, 380-to-1000-cycle power. All operating voltages for the equipment are obtained through Power Supply PP-298/ARC-21X. All connections are made by plugs and jacks.

1-16A. POWER SUPPLY PP-1831/ARC. This supply is identical with Power Supply PP-298/ARC-21X, except that mounting rack MT-1917/U is used and the supply is housed in a pressurized case. This supply may be used where altitudes above 50,000 feet are required.

1-17. DYNAMOTOR ASSEMBLY DY-50/ARC-21. As with the other power supply, this power supply is mounted on Mounting MT-972/U, from which it can be readily removed for servicing. Located at a convenient place in the aircraft, within reasonable distance of Receiver-Transmitter RT-128A/ARC-21, this power supply is used when only a 27.5-volt d-c power is available on the aircraft. All operating voltages are obtained through the power supply. All connections are by plugs and jacks.

1-18. ADAPTER, KEYER GROUP MX-1394/ARC-21. This unit consists of ratchet-motor-driven switches and the necessary bridge resistors to control the tune-up and operation of the equipment. The unit is energized through Control Panel C-790/ARA-26 (not supplied). Once tune-up is completed the code generator keys the Radio Set AN/ARC-21 transmitter and the equipment continues to operate until turned off or power failure occurs.

1-19. MOUNTING MT-1555/U. This mounting is fastened to the aircraft frame to provide a shock mounted support for the Adapter, Keyer Group MX-1394/ARC-21. Removal and replacement of the Adapter, Keyer Group MX-1394/ARC-21 is simple, requiring the loosening and tightening of one clamping screw.

1-20. MOUNTING MT-971/U. This mounting is fastened to the aircraft frame to provide a shock mounted support for Receiver-Transmitter RT-128A/ARC-21. Removal from and replacement of Receiver-Transmitter RT-128A/ARC-21 on the mounting is simple, requiring the loosening and tightening of only two clamping screws.

1-21. MOUNTING MT-972/U. This mounting is fastened to the aircraft frame to provide shock mounting for either type of power supply used with the equipment. Power supply removal is simple, requiring only the loosening or tightening of two clamping screws.

1-22. RELAY, SOLENOID RE-132/ARC. This relay grounds the far end of the fixed-wire antenna in order to obtain a more desirable antenna impedance when the operating frequency is such as to make it desirable. This function is performed automatically and requires no attention from the operator.

1-23. PRINCIPLES OF OPERATION.

1-24. FREQUENCY CONTROL. The most outstanding feature of Radio Set AN/ARC-21 is its method of frequency selection control. Radio Set C-451A/ARC-21 contains one-half of a bridge circuit, driven by the channel selector knob. When a channel is selected at this unit, circuits in Receiver-Transmitter, Radio RT-128A/ARC-21 drive the other half of the bridge circuit to balance, and in so doing select the proper frequency determining components.

1-25. After selection, the slug-tuned variable frequency oscillator and associated receiver and transmitter components are motor driven to the approximate frequency under control of a phase discriminator circuit. A portion of the variable frequency oscillator output is reduced to 50 kilocycles by successive heterodyning with a series of crystal oscillators and harmonic generators that are automatically connected as required for the selected frequency. The resultant output is compared with a stable 50-kilocycle reference voltage in the phase discriminator, whose output provides the error signal controlling the tuning motor.

1-26. Final frequency control is provided by a reactance tube in the variable-frequency oscillator circuit. This also receives its control voltage from the phase discriminator circuit.

1-27. Part of the variable-frequency oscillator output is doubled to provide the receiver converter injection voltage, part goes to the frequency control system, and part supplies the transmitter excitation. The transmitter excitation is fed into a balanced modulator which shifts the frequency by one-half the first intermediate frequency to enable the receiver injection frequency and transmitter excitation to be obtained from the same source.

1-28. The balanced modulator output is amplified and the frequency is doubled. The output of the driver-doubler, at the operating frequency, drives the power amplifier, while a small portion of the signal goes into a phase discriminator as a comparison voltage for power amplifier tank tuning control.

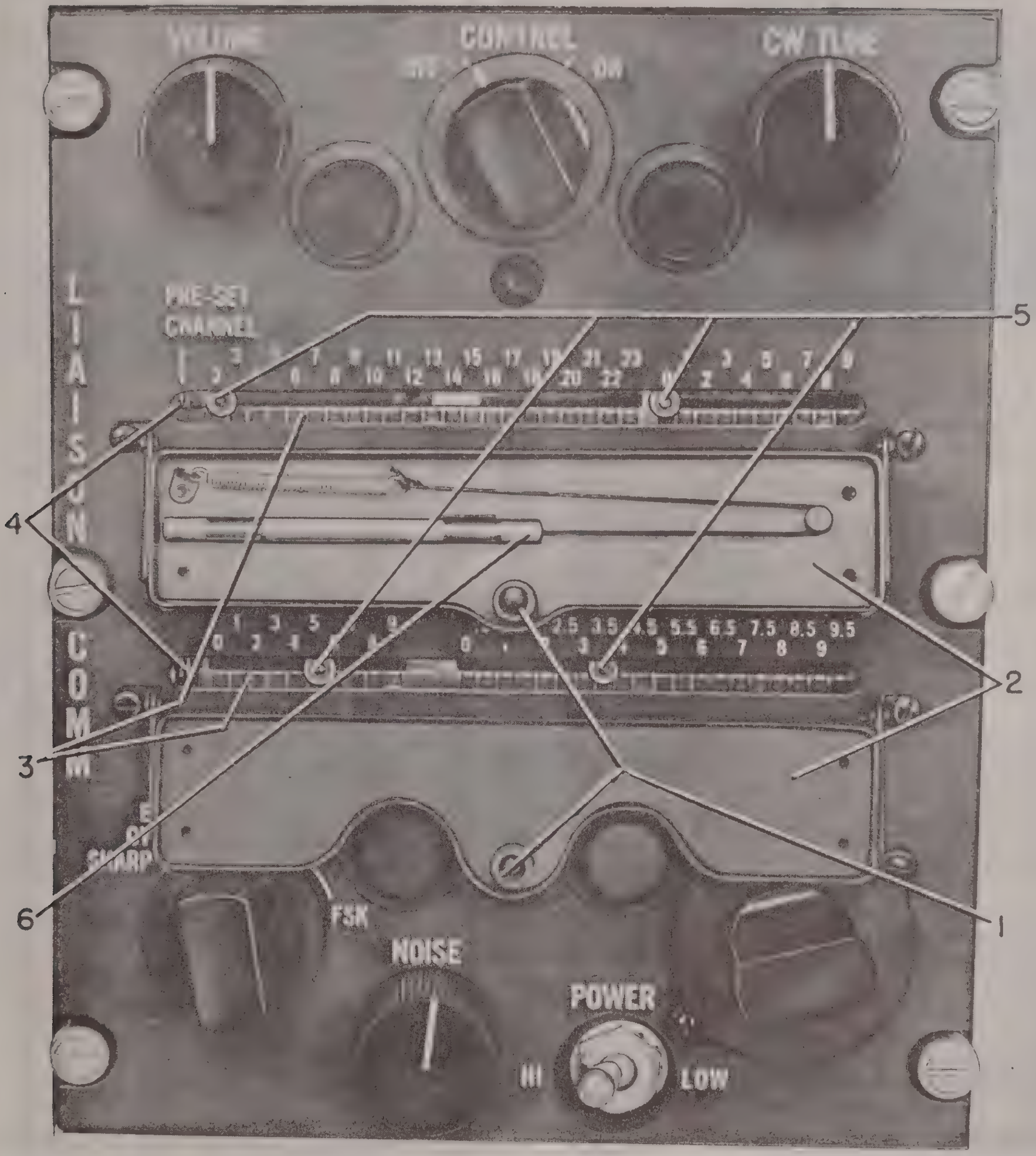


Figure 1-3. Radio Set Control C-451A/ARC-21, Presetting Controls (See table VII.)

1-29. OPERATING CHARACTERISTICS.

1-30. Principal operating characteristics of Radio Set AN/ARC-21 are given in table III.

1-31. TUBE COMPLEMENT.

1-32. Subminiature tubes used in this equipment are identified by the symbol "A", indicating the particular specification to which the tubes are made. These tubes have short leads (13/64 inch). Use only these types for replacement.

1-33. Radio Receiver Transmitter RT-128A/ARC-21 is made up of a number of removable chassis. Tube complement is listed, by chassis, in table IV. Table V lists the tube complement of power supply PP-298/ARC-21X. Other components of Radio Set AN/ARC-21 contain no electron tubes.

1-34. SUPPLY VOLTAGES AND CURRENTS.

1-35. Table VI gives voltages and currents required during different functions of the two aircraft power supplies for Radio Set AN/ARC-21.

1-36. FUSES AND CIRCUIT BREAKERS.

1-37. No fuses or circuit breakers are used in the equipment since the units in which they normally would be installed are remote controlled and would not be accessible during flight to permit reset or replacement. An aneroid switch throws the equipment into low-power operation if leakage in the case seals allows the pressure to drop during altitude flights. If for any reason the temperature within the Radio Receiver-Transmitter unit reaches 85°C (185°F) a thermostat will close, tripping the "CONTROL" switch on the Radio Set Control panel to "OFF".

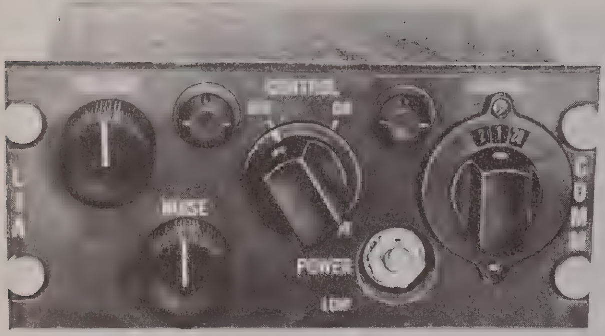


Figure 1-4. Radio Set Control C-455/ARC, Operating Controls

1-38. LOCATION AND FUNCTION OF CONTROLS.

1-39. All equipment controls are located on either Radio Set Control C-451A/ARC-21 or Radio Set Control C-455/ARC at operating positions in the aircraft. Any other tuning or adjustment controls must be considered as installation or maintenance adjustments since the equipment will have to be removed from the case to provide access.

1-40. Table VII lists location and function of operating and presetting controls on Radio Set Control C-451A/ARC-21. Operating controls of Radio Set Control C-455/ARC are illustrated in figure 1-4. Controls have the same function as those of corresponding name on Radio Set Control C-451A/ARC-21.

TABLE I. EQUIPMENT SUPPLIED, RADIO SET AN/ARC-21

Quantity	Name of Unit	AN Type Designation	Approx. Overall Dimensions (Inches)			Volume (Cu Ft)	Approx. Weight (lb.)
			Height	Width	Depth		
1	Radio Receiver-Transmitter	RT-128A/ARC-21	19	(dia) 18.12	26.12	6.54	132
1	Radio Set Control	C-451A/ARC-21	7.12	5.75	5.12	0.12	5.34
1	ERA Coupler	GFE					
1	Power Supply (depending on supply voltage) Dynamotor Assembly (27.5 volt-dc supply)	DY-50/ARC-21	7.25	8.87	12.75	0.48	30.5
	Power Supply (27.5-volt dc and 115-volt ac, 380 to 1000 cycles)	PP-298/ARC-21X	7.72	8.87	12.75	0.5	25.5
	Power Supply (27.5-volt dc and 115-volt at 380 to 1000 cycles)	PP-1831/ARC	12.00	10.812	13.375	0.9	31
1	Adapter, Keyer Group	MX-1394/ARC-21	3.75	2.75	5	0.03	1.6
1	Mounting (for Receiver-Transmitter)	MT-971/U	2.12	18.62	18.37	0.41	4
1	Mounting (for Power Supply PP-298/ARC-21X)	MT-972/U	2.88	8.75	13.22	0.2	1.38
	Mounting (for Power Supply PP-1831/ARC)	MT-1917/U	2.88	8.75	13.22	0.2	1.38
1	Mounting (for Adapter, Keyer Group)	MT-1555/U	2.78	3.75	7.87	0.05	1
1	Relay, Solenoid	RE-132/ARC	8	3.25	3.25	0.05	2.5
1 to 5	Radio Set Control	C-455/ARC	2.62	5.75	4.4	0.04	1.5

TABLE II. EQUIPMENT REQUIRED BUT NOT SUPPLIED, RADIO SET AN/ARC-21

Name of Unit	AN Type Designation	Required Use
Aircraft* with the following items:		
Fixed wire antenna suitable for Radio Set AN/ARC-21		Radiate or receive signals
Cabling to accommodate Radio Set AN/ARC-21		Supply connections
Power Source - 27.5 volts dc or 27.5 volts dc and 115 volts ac 380 to 1000 cycles		Supply power
Interphone	AN/AIC-10	Audio input and output
Telegraph Key	J-37	Cw transmission
Teletypewriter**	TT-124/AG PGC-1	Teletype transmission and reception
Three non-standard connectors:		
1. For power cable (male) RCA-462318-1		Power cable to power supply
2. For power cable (female) RCA-462336-1		Power cable to Receiver-Transmitter
3. For control cable (male) RCA-462336-2		Control cable to Receiver-Transmitter
Emergency Keyer Consisting of	AN/ARA-26	Emergency tune up and transmissions
Keyer	KY-65/ARA-26	Supply keyed signals
Control Panel	C-790/ARA-26	Emergency keyer on-off

* The equipment can be used at fixed locations if the same requirements are fulfilled.

** Optional; requires a frequency shift keying adaptor, an accessory item not supplied: Type TT-124/AG is for interim use, and will be replaced by Type PGC-1 which is in development stage.

TABLE III. OPERATING CHARACTERISTICS

RADIO SET AN/ARC-21

General	
Frequency range (mc)	2.0000 to 23.9995 in 500-cycle steps. Receiver and Transmitter operate on same frequency
Available frequencies	44,000
Presetting	Any 20 of 44,000 available frequencies may be present at one time
Transmitter	
Power output	
"POWER" switch in "HI" position	100 watts
"POWER" switch in "LOW" position	10 watts
Frequency stability	
Below 10.0 mc	± 150 cps
Above 10.0 mc	± 0.0015 percent
Receiver	
Type	Superheterodyne; double conversion for voice, triple conversion for CW.

TABLE III. OPERATING CHARACTERISTICS RADIO SET AN/ARC-21 (continued)

Intermediate frequencies	
First	1800 kc
Second	300 kc
Third (cw only)	105 kc
Tuning	Automatically tuned to same frequency as transmitter. Tunable 3rd i-f conversion oscillator (±4 kc) for fine tuning and control of beat frequency.
Selectivity (6 db bandwidth)	
Voice and frequency-shift keying	8 kc
"CW BROAD"	4 kc
"CW SHARP"	0.5 kc
Sensitivity (for 10-to-1 signal-to-noise power ratio)	
Voice	2-5 uv
CW	1-3 uv
Image rejection	Better than 80 db

TABLE IV. TUBE COMPLEMENT, RECEIVER-TRANSMITTER, RADIO RT-128A/ARC-21

Quantity	Type	Symbol	Function
AMPLIFIER, AUDIO FREQUENCYAM-773A/ARC-21			
4	JAN-6021A	V101	Clipper
		V102	Amplifier
		V103	Phase Splitter
		V109	Servo Pre-Amplifier
1	JAN-5687	V104	Driver
2	JAN-4-65A	V105	Modulator
		V106	Modulator
1	JAN-OA2	V107	Voltage Regulator
1	JAN-OB2	V108	Voltage Regulator
RELAY ASSEMBLY RE-134A/ARC-21			
1	5643A	V201	Clutch Control
2	JAN-5840A	V202	Tuning Control
		V205	Regulator Amplifier
1	JAN-5719A	V203	Side Tone Oscillator
1	JAN-991	V204	Regulator Reference
1	JAN-5687	V206	Series Regulator
AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21			
2	JAN-4-65A	V401	Power Amplifier
		V402	Power Amplifier
3	JAN-5718	V403	Dynamotor Delay
		V404	Transfer Diode
		V405	Transfer Control Amplifier

TABLE IV. TUBE COMPLEMENT, RECEIVER-TRANSMITTER, RADIO RT-128A/ARC-21 (continued)

Quantity	Type	Symbol	Function
AMPLIFIER-OSCILLATOR AM-776A/ARC-21			
2	JAN-5899A	V501	Receiver Antenna Amplifier
		V502	Receiver R-F Amplifier
3	JAN-5636A	V503	Mixer
		V508	Balanced Modulator
		V509	Balanced Modulator
4	JAN-5840A	V504	Doubler
		V505	Reactance Control
		V506	Master Oscillator
		V507	Buffer
2	JAN-5902A	V510	First Amplifier
		V511	Second Amplifier
2	JAN-2E26	V512	Push-Push Doubler
		V513	Push-Push Doubler
1	JAN-5896A	V514	Phase Detector
AMPLIFIER-DETECTOR AM-777A/ARC-21			
3	JAN-5899A	V701	1800-kc I-F Amplifier
		V703	1st 300-kc I-F Amplifier
		V704	2nd 300-kc I-F Amplifier
4	JAN-5636A	V702	300-kc Mixer
		V707	1st Audio Amplifier
		V712	105-kc Mixer
		V713	105-kc Amplifier
3	JAN-5896A	V705	A. Audio Detector B. RF-AVC Detector
		V706	A. Automatic Noise Limiter B. RF-AVC Control
		V716	Audio AVC
3	JAN-6021A	V708	A. 2nd Audio Amplifier B. Squelch
		V711	A. 195-kc Oscillator Control B. 195-kc Oscillator
		V714	A. CW Detector B. 106-kc BFO
1	JAN-5902A	V709	Audio Output
1	JAN-5840A	V710	500-kc Tripler
1	JAN-5719A	V715	RF-AVC Amplifier
AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21			
7	JAN-5636A	V801	2nd Mixer
		V802	3rd Mixer
		V803	4th Mixer
		V805	Regenerative Divider and Mixer
		V811	450-900-kc Amplifier
		V813	265-270-kc Mixer
		V816	35-80-kc Amplifier
3	JAN-5896A	V804	Frequency Discriminator
		V808	Phase Detector
		V812	AVC Diode
3	JAN-5840A	V806	Regenerative Divider Tripler
		V810	50-kc Harmonic Generator
		V817	5-kc Harmonic Generator
4	JAN-6021A	V807	A. Phase Inverter B. Cathode Follower
		V809	A. Phase Detector B. Phase Detector
		V814	120 to 120.75-kc Crystal Oscillator
		V815	145 to 149-kc Crystal Oscillator

TABLE IV. TUBE COMPLEMENT, RECEIVER-TRANSMITTER, RADIO RT-128A/ARC-21 (continued)

Quantity	Type	Symbol	Function
OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21			
4	JAN-5840A	V901	500-kc Reference Oscillator
		V907	Harmonic Generator Amplifier
		V909	Harmonic Generator
		V910	500-kc Doubler
4	JAN-6021A	V902	A. Buffer Amplifier B. 100-kc Locked-in Oscillator
		V903	A. 50-kc Locked-in Oscillator B. 100-kc Amplifier
		V904	A. 10-kc Locked-in Oscillator B. 50-kc Amplifier and Pulse Shaper
		V905	A. 5-kc Locked-in Oscillator B. 5-kc Amplifier
2	JAN-5636A	V906	600 to 1100-kc Mixer
		V911	900-kc Mixer
1	JAN-5896A	V908	AVC Rectifier
RELAY ASSEMBLY RE-135B/ARC-21			
1	JAN-5670	V1001	Servo Amplifier (See Note)

Note: As a result of circuit modifications, V1001 no longer has any active function. It is left in the circuit only to maintain continuity of the series-parallel heater string.

TABLE V. TUBE COMPLEMENT, POWER SUPPLY PP-298/ARC-21X

Quantity	Type	Symbol	Function
4	JAN-3B28	V1701	1000-volt Rectifier
		V1702	400-volt Rectifier
		V1703	400-volt Rectifier
		V1704	1000-volt Rectifier
1	JAN-3B22	V1705	140-volt Rectifier

TABLE VA. TUBE AND CRYSTAL RECTIFIER COMPLEMENT, POWER SUPPLY PP-1831/ARC

Quantity	Type	Symbol	Function
4	JAN-3B28	V4701	1000-volt Rectifier
		V4702	400-volt Rectifier
		V4703	400-volt Rectifier
		V4704	1000-volt Rectifier
1	1N539	CR4701	140-volt Rectifier
1	1N539	CR4702	-20-volt Rectifier

TABLE VI. SUPPLY VOLTAGES AND CURRENTS, RADIO SET AN/ARC-21

Power Supply Type	Input Volts	*Current (amperes) Required			
		Receive	Transmit CW and FSK**	Transmit Voice	Tuning
DY-50/ARC-21	27.5 dc	25	53.5	59	45
PP-298/ARC-21X	27.5 dc	17	21	21	37
PP-1831/ARC	27.5 dc	17	21	21	37
	115 ac 380-1000 cycles	2.5	+7.2	8.0	2.5

* Both blowers operating
** Frequency Shift Keying

TABLE VII. LOCATION AND FUNCTION OF CONTROLS, RADIO SET CONTROL C-451A/ARC-21

Index No.	Item	Function
Figure 1-2	Controls Used During Normal Operation	
1	"CHANNEL" switch	Selects preset channel
2	"CONTROL" switch	On-off switch. In "ON" position, takes control if equipment is turned on elsewhere.
3	"CW SHARP - CW BROAD-VOICE - FSK" switch	Sets type of operation
4	"VOLUME" control	Adjusts loudness of received signals
5	"NOISE" control	Sets sensitivity and squelch threshold (voice operation only)
6	"CW TUNE" control	Fine tuning for cw operation
7	"POWER" switch	Selects "HI" (100-w) or "LOW" (10-w) transmitter output power
8	Pilot lights (2)	Illuminate panel. Replaceable
Figure 1-3	Controls used in Setting Up Preset Channels	
1	Thumb screws	Secure drum covers
2	Drum covers	Open to expose digit buttons
3	Drums	Hold preset frequency information
4	Channel number	Number of channel exposed for presetting appears directly beneath arrow.
5	Digit buttons	Determine preset frequency. Buttons are placed directly beneath digits representing frequency to be preset.
6	Presetting tool	Used to move digit buttons.

SECTION II

PREPARATION FOR USE AND RESHIPMENT

2-1. PREPARATION FOR USE.

2-2. UNPACKING.

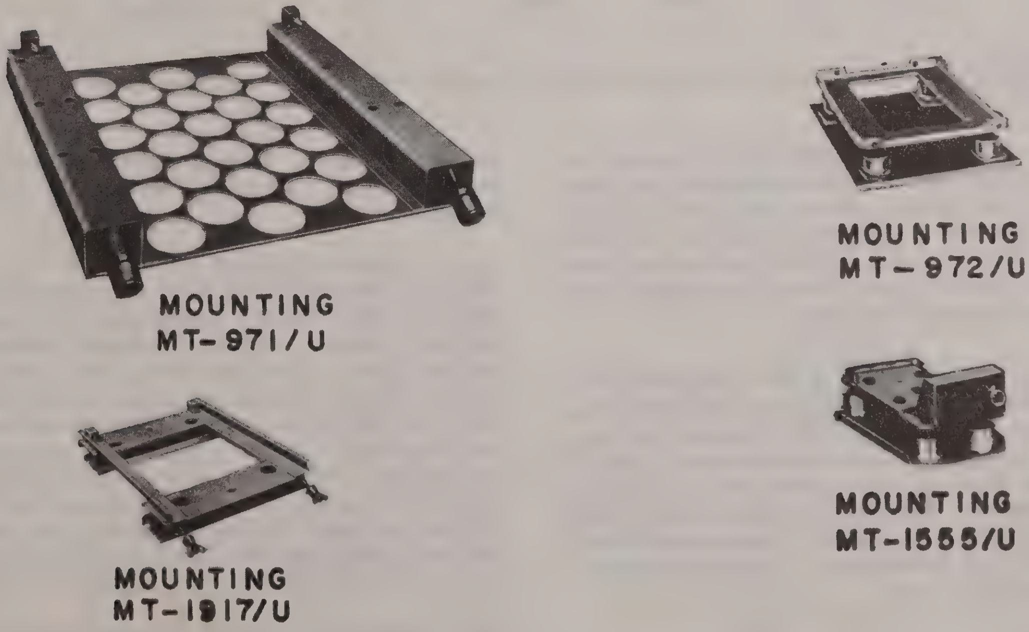
2-3. Unpack the various items carefully, taking care not to damage the shipping containers any more than necessary, since they will have to be used for reshipment Save all the packing material including iron strapping, boxes, cartons, moisture barrier, cradles, fillers, rubberized hair pads and cans in a clean dry place until required for reshipment. Check that the boxes and cradles are properly marked for the unit type they are designed to ship.

2-4. RECEIVER-TRANSMITTER RT-128A/ARC-21. Two men are required to safely unpack this unit. Several types of packing are used but these instructions will provide a suitable guide in any case. Cut the iron strapping with metal shears or a hammer and chisel. These straps will not be usable again on this size box Open the ply-wood case carefully, using a nail puller to remove the nails from the top. Lift off the box top and the top padding

2-5. Slide the corrugated cardboard carton out of the ply-wood case. Slit the tape sealing the carton at top ends and top center. Open the carton flaps. If the flaps are pasted shut, pry open with a knife to prevent damage to the flaps. Slide the contents of the carton on the bench and turn up right as it was packed. Next carefully open the moisture barrier and the corrugated cardboard container inside the moisture barrier.

2-6. Remove the packing material around the top and sides of the Receiver-Transmitter RT-128A/ARC-21 and lift it out of the carton. Remove the carriage bolts holding the receiver-transmitter to the wooden pallet and lift the equipment off the pallet. Repack all the packing material in the plywood container and store for future use.

2-7. MOUNTINGS. (See figure 2-1.) The various mountings are shipped in similar packing of two types: individual and quantity. The quantity packing consists of a number of the individually packed units in the proper sized corrugated cardboard carton. The unpacking details start with the quantity packing.



MOUNTING MT-971/U

MOUNTING MT-972/U

MOUNTING MT-1917/U

MOUNTING MT-1555/U

Figure 2-1 Mountings MT-971/U, MT-972/U, MT-1917/U, and MT-1555/U

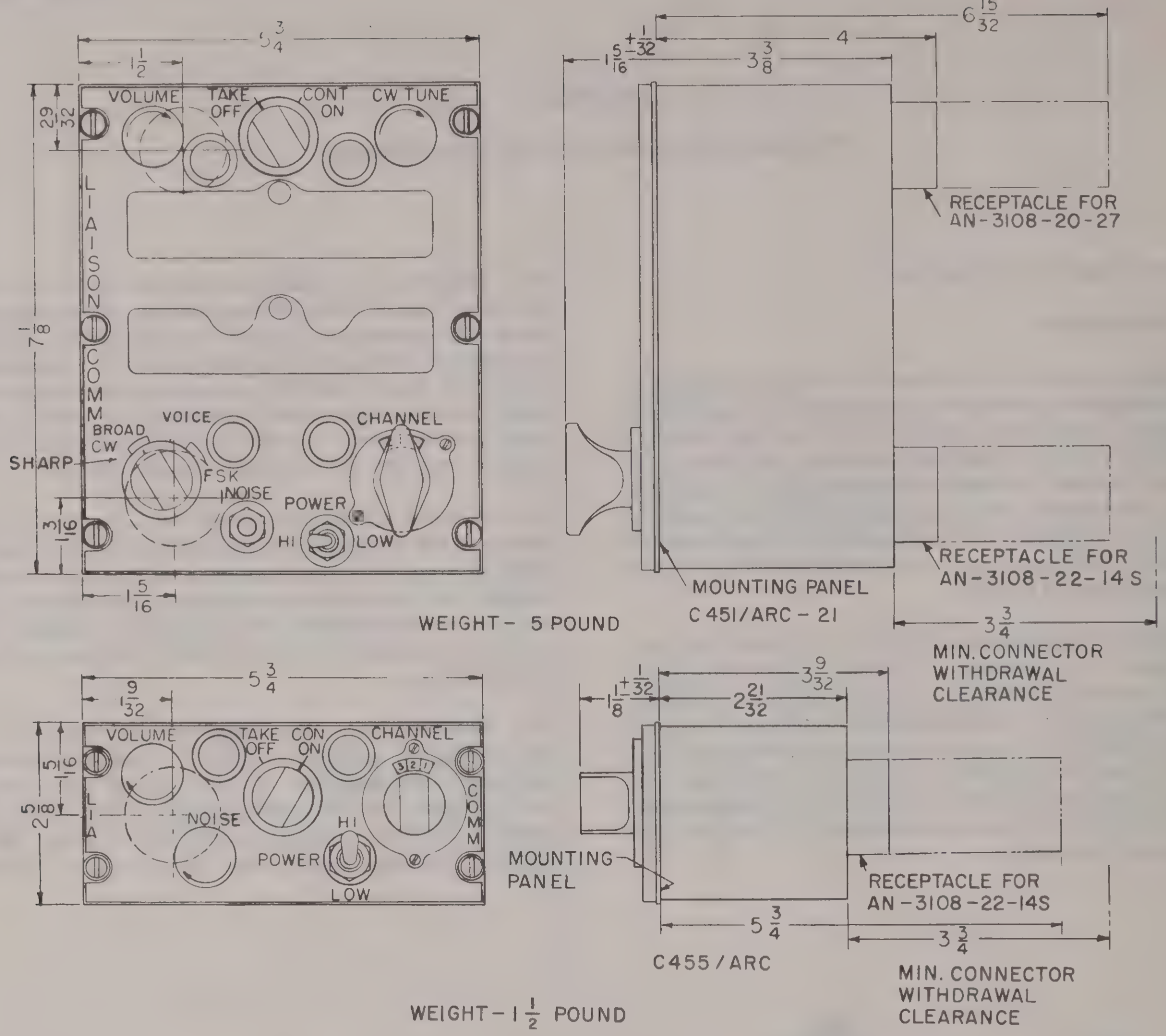

5 3/4
1 1/2
29/32
VOLUME
TAKE OFF
CONT ON
CW TUNE
LIAISON
COMM
7 1/8
BROAD
CW
VOICE
CHANNEL
SHARP
FSK
NOISE
POWER
HI
LOW
1 3/16
1 5/16
WEIGHT - 5 POUND
6 15/32
4
+1/32
1 5/16
3 3/8
RECEPTACLE FOR AN-3108-20-27
RECEPTACLE FOR AN-3108-22-14 S
MOUNTING PANEL
C 451/ARC - 21
3 3/4
MIN. CONNECTOR WITHDRAWAL CLEARANCE
5 3/4
1 9/32
VOLUME
TAKE OFF
CON ON
CHANNEL
3 2 1
1 5/16
2 5/8
LIA
NOISE
COMM
HI
POWER
LOW
3 9/32
+1/32
1 1/8
2 21/32
MOUNTING PANEL
RECEPTACLE FOR AN-3108-22-14S
5 3/4
3 3/4
C455/ARC
MIN. CONNECTOR WITHDRAWAL CLEARANCE
WEIGHT - 1 1/2 POUND

Figure 2-2. Mounting Dimensions, Radio Set Control C-451A/ARC-21 and Radio Set Control C-455/ARC

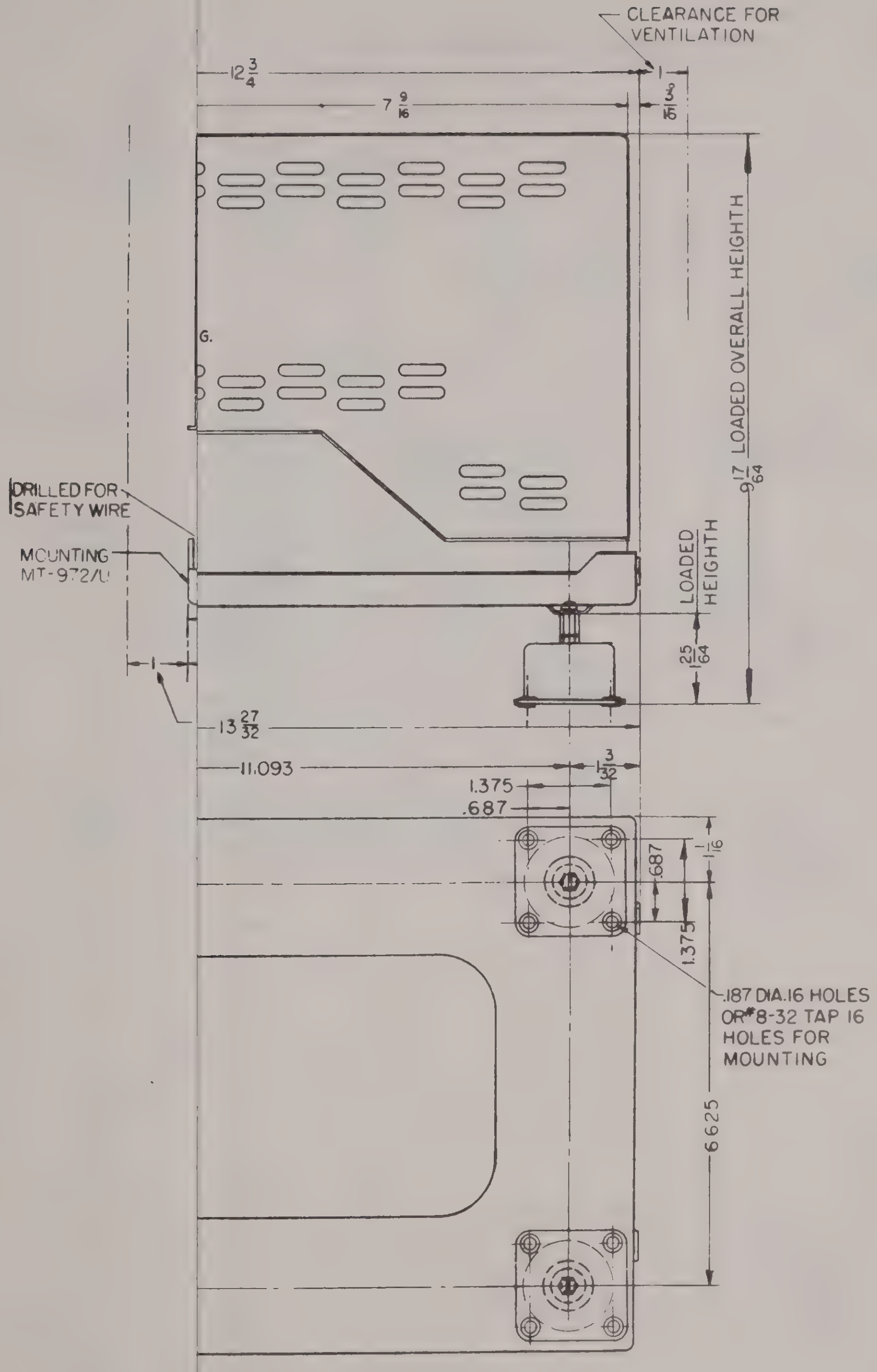
2-8. Cut the iron strapping with metal shears or hammer and chisel. Slit the tape sealing the top flaps at ends and in the box top center. Pry open the flaps carefully, with a knife if they are pasted shut, to prevent damage. Remove the individual cartons and open by slitting the sealing tape. Remove contents from carton and open moisture barrier.

2-9. RADIO SET CONTROLS. Either type radio set control is packed singly and in quantity. The following unpacking instructions include both types of packing. Cut the iron strapping with metal shears or hammer and chisel. The bands will not be reusable on this size package. Slit the tape sealing the flaps at end and along the carton top center. Pry open the flaps carefully with a knife, if they are pasted shut, to prevent damage. Remove individual cartons.

2-10. Slit the tape sealing one end of the individual-pack carton. Open the flaps and slide the contents out of the carton. Slit the moisture barrier at one end and remove the internal carton. Slit the sealing tape at one end of this carton, open the flaps and slide the control out of the carton. A spacer or collar may have to be removed first. Save all the packing material for reshipment.

2-11. POWER SUPPLY PP-298/ARC-21X, POWER SUPPLY PP-1831/ARC AND DYNAMOTOR ASSEMBLY DY-50/ARC-21. These units are packed in a similar fashion except for minor differences described later. Open the corrugated cardboard cartons by slitting the tape sealing the top flaps at the ends and top center of the carton. Carefully pry open the flaps with a knife, if pasted, to prevent damage to the flaps. Slide the inside carton out on the bench and open in similar fashion. Cut open the moisture barrier and open the inside carton at the top. Lift out the top packing and then the unit. For Dynamotor Assembly DY-50/ARC-21 this completes the unpacking.

2-12. Remove the cover of Power Supply PP-298/ARC-21X or the pressurized case of PP-1831/ARC. Next remove the packing inside the cover and the tube wrappers. Finally remove the tag from the cover and replace the cover on the power supply. Reassemble all packing material and store for future use.


CLEARANCE FOR VENTILATION
12 3/4
7 9/16
1
3/16
LOADED OVERALL HEIGHTH
9 17/64
G.
DRILLED FOR SAFETY WIRE
MOUNTING MT-972/U
LOADED HEIGHTH
1 25/64
1
13 27/32
11.093
1 3/32
1.375
.687
.687
1 1/16
1.375
.187 DIA.16 HOLES OR #8-32 TAP 16 HOLES FOR MOUNTING
6.625

①

s, Power Supply PP-298/ARC-21X

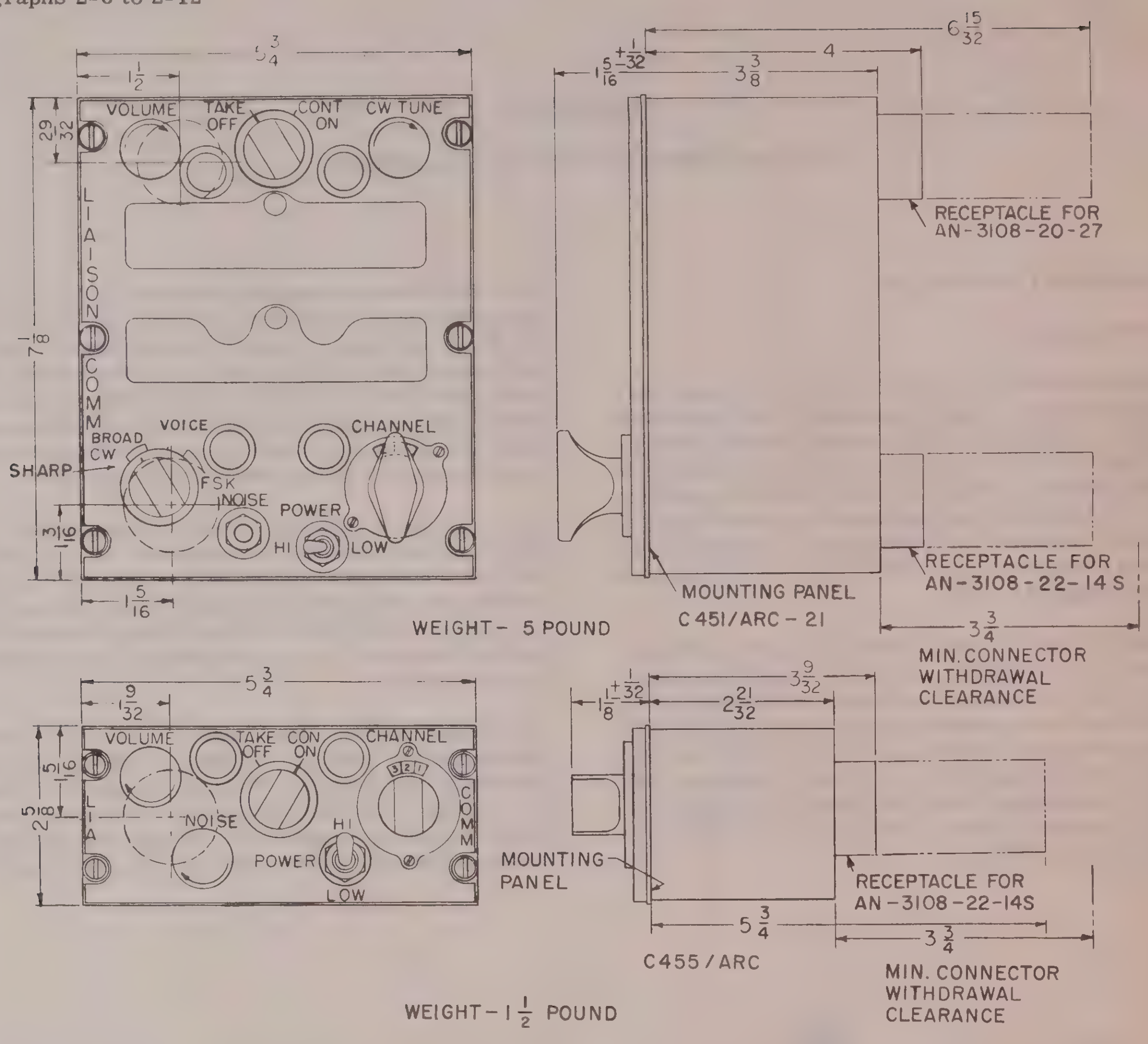

5 3/4
1 1/2
29/32
VOLUME
TAKE OFF
CONT ON
CW TUNE
L I A I S O N
C O M M
7 1/8
BROAD
CW
VOICE
CHANNEL
SHARP
FSK
NOISE
POWER
HI
LOW
3/16
1 5/16
WEIGHT- 5 POUND
6 15/32
4
+1/32
1 5/16
3 3/8
RECEPTACLE FOR AN-3108-20-27
RECEPTACLE FOR AN-3108-22-14 S
MOUNTING PANEL
C 451/ARC - 21
3 3/4
MIN. CONNECTOR WITHDRAWAL CLEARANCE
5 3/4
1 9/32
1 5/16
2 5/8
VOLUME
TAKE OFF
CON ON
CHANNEL
3 2 1
L I A
C O M M
NOISE
HI
POWER
LOW
WEIGHT - 1 1/2 POUND
±1/32
1 1/8
3 9/32
2 21/32
MOUNTING PANEL
RECEPTACLE FOR AN-3108-22-14S
5 3/4
3 3/4
C455/ARC
MIN. CONNECTOR WITHDRAWAL CLEARANCE

Figure 2-2. Mounting Dimensions, Radio Set Control C-451A/ARC-21 and Radio Set Control C-455/ARC

2-8. Cut the iron strapping with metal shears or hammer and chisel. Slit the tape sealing the top flaps at ends and in the box top center. Pry open the flaps carefully, with a knife if they are pasted shut, to prevent damage. Remove the individual cartons and open by slitting the sealing tape. Remove contents from carton and open moisture barrier.

2-9. RADIO SET CONTROLS. Either type radio set control is packed singly and in quantity. The following unpacking instructions include both types of packing. Cut the iron strapping with metal shears or hammer and chisel. The bands will not be reusable on this size package. Slit the tape sealing the flaps at end and along the carton top center. Pry open the flaps carefully with a knife, if they are pasted shut, to prevent damage. Remove individual cartons.

2-10. Slit the tape sealing one end of the individual-pack carton. Open the flaps and slide the contents out of the carton. Slit the moisture barrier at one end and remove the internal carton. Slit the sealing tape at one end of this carton, open the flaps and slide the control put of the carton. A spacer or collar may have to be removed first. Save all the packing material for reshipment.

2-11. POWER SUPPLY PP-298/ARC-21X, POWER SUPPLY PP-1831/ARC AND DYNAMOTOR ASSEMBLY DY-50/ARC-21. These units are packed in a similar fashion except for minor differences described later. Open the corrugated cardboard cartons by slitting the tape sealing the top flaps at the ends and top center of the carton. Carefully pry open the flaps with a knife, if pasted, to prevent damage to the flaps. Slide the inside carton out on the bench and open in similar fashion. Cut open the moisture barrier and open the inside carton at the top. Lift out the top packing and then the unit. For Dynamotor Assembly DY-50/ARC-21 this completes the unpacking.

2-12. Remove the cover of Power Supply PP-298/ARC-21X or the pressurized case of PP-1831/ARC. Next remove the packing inside the cover and the tube wrappers. Finally remove the tag from the cover and replace the cover on the power supply. Reassemble all packing material and store for future use.

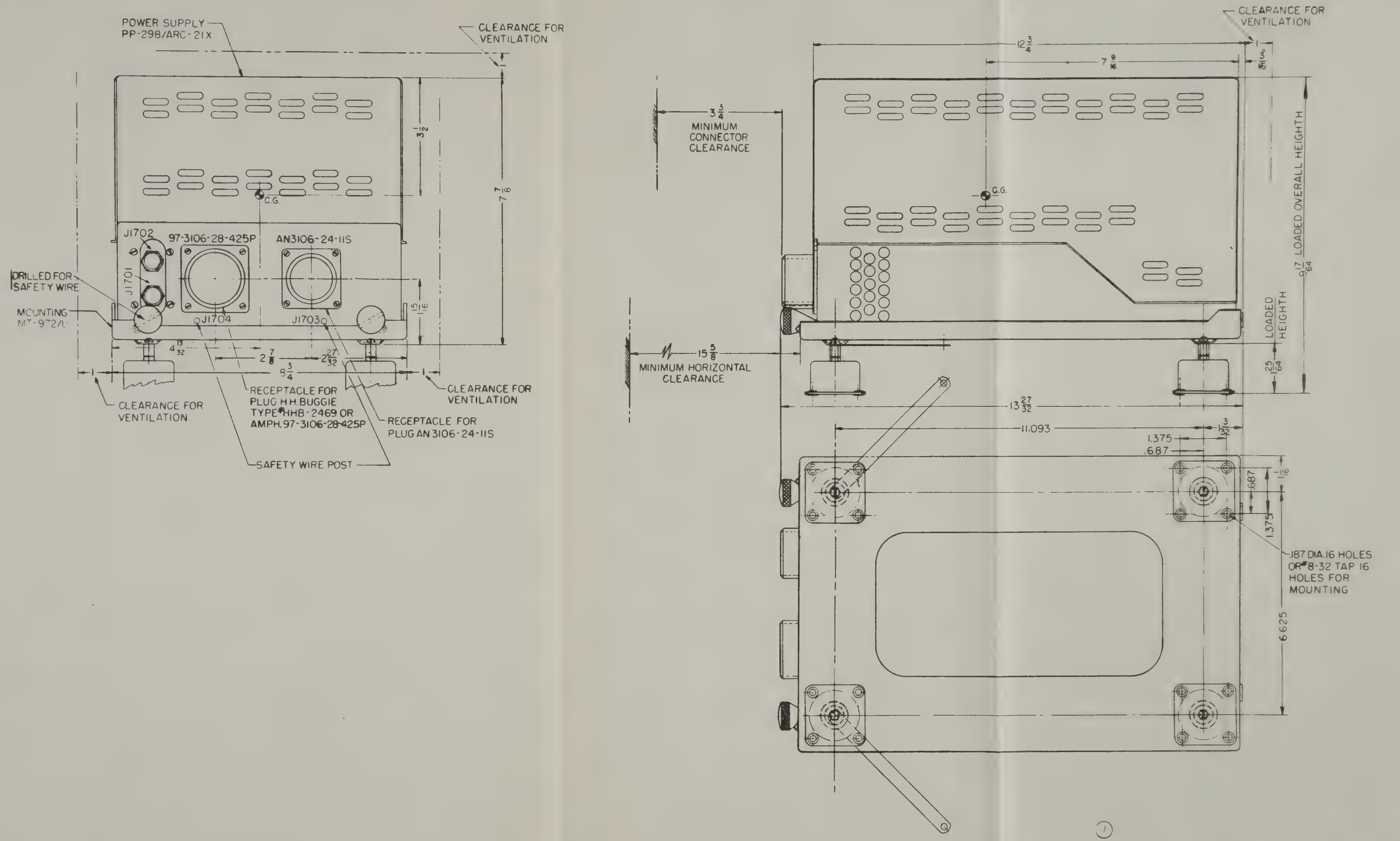
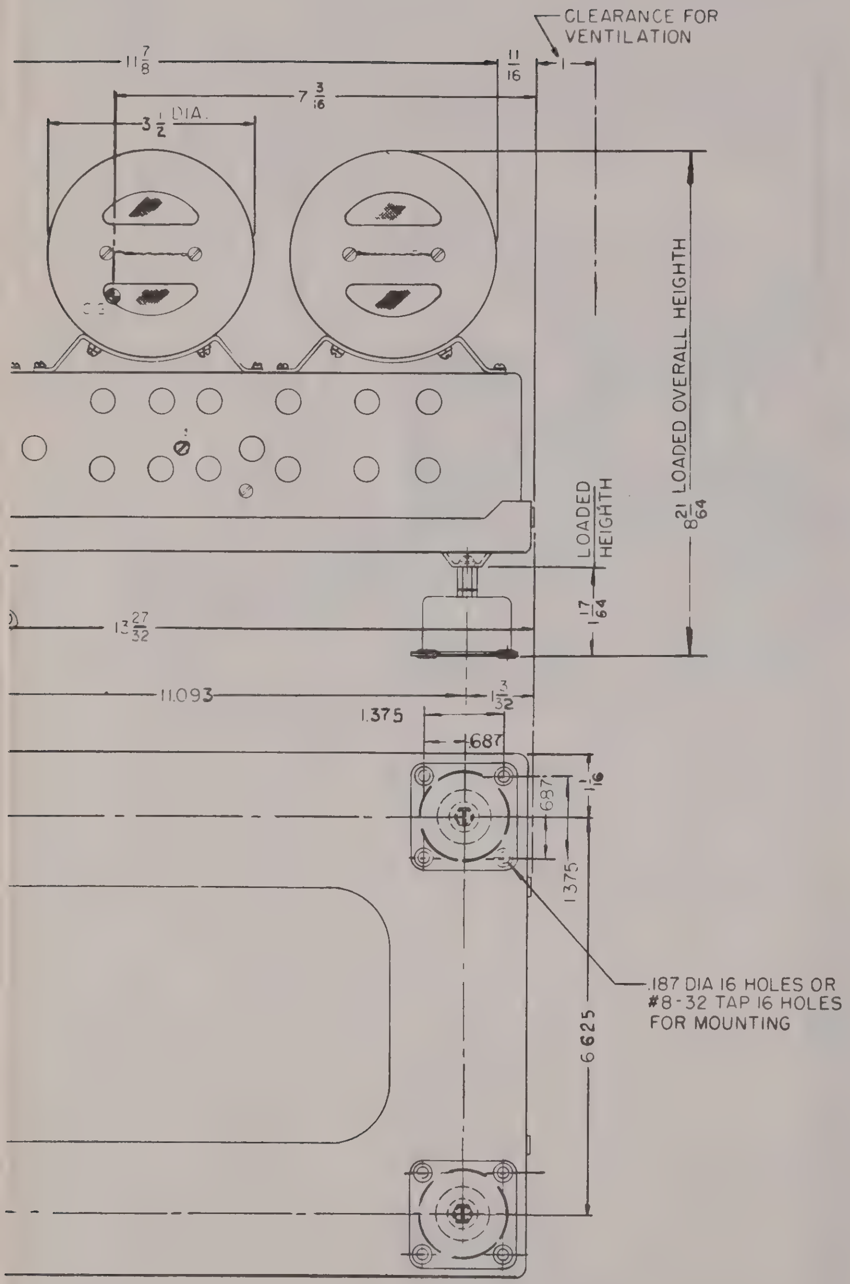
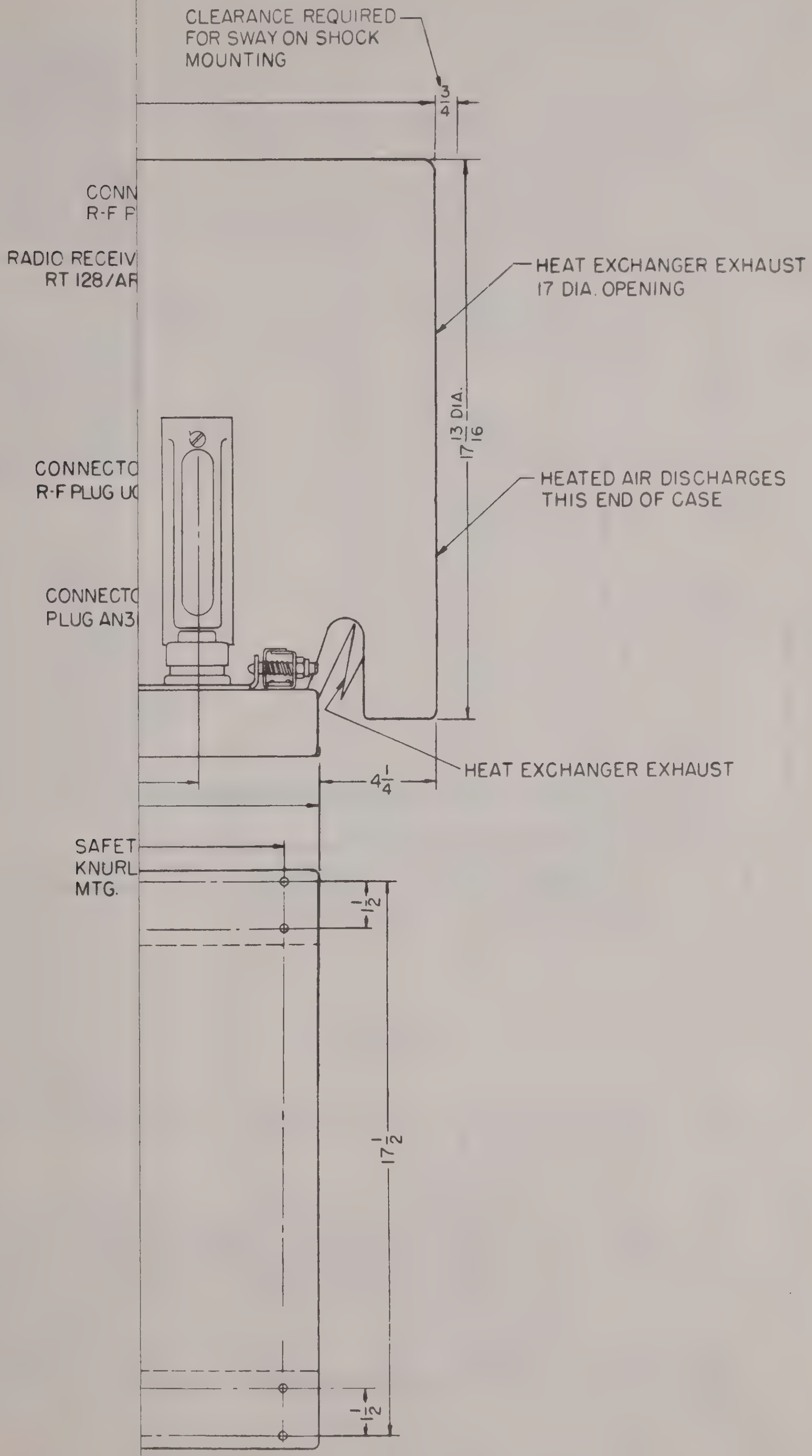

POWER SUPPLY PP-298/ARC-21X
CLEARANCE FOR VENTILATION
3 1/2
7 7/8
C.G.
J1702
97-3106-28-425P
AN3106-24-11S
J1701
DRILLED FOR SAFETY WIRE
MOUNTING MT-972/U
J1704
J1703
1 15/16
4 13/32
2 7/8
2 27/32
8 3/4
RECEPTACLE FOR PLUG H.H.BUGGIE TYPE #HHB-2469 OR AMPH.97-3106-28-425P
RECEPTACLE FOR PLUG AN3106-24-11S
CLEARANCE FOR VENTILATION
CLEARANCE FOR VENTILATION
SAFETY WIRE POST
CLEARANCE FOR VENTILATION
12 3/4
7 9/16
1
3/8
3 3/4
MINIMUM CONNECTOR CLEARANCE
C.G.
9 17/64 LOADED OVERALL HEIGHTH
LOADED HEIGHTH
1 25/64
15 5/8
MINIMUM HORIZONTAL CLEARANCE
13 27/32
11.093
1 3/32
1.375
.687
.687
1 1/16
1.375
.187 DIA.16 HOLES OR #8-32 TAP 16 HOLES FOR MOUNTING
6.625

Figure 2-3. Mounting Dimensions, Power Supply PP-298/ARC-21X


CLEARANCE FOR VENTILATION
11 7/8
11/16
1
7 3/16
3 1/2 DIA.
LOADED OVERALL HEIGHTH
8 21/64
LOADED HEIGHTH
1 17/64
13 27/32
11.093
1 3/32
1.375
.687
.687
1 1/16
1.375
.187 DIA 16 HOLES OR #8-32 TAP 16 HOLES FOR MOUNTING
6.625


CLEARANCE REQUIRED FOR SWAY ON SHOCK MOUNTING
3/4
CONN
R-F P
RADIO RECEIV
RT 128/AR
HEAT EXCHANGER EXHAUST 17 DIA. OPENING
17 13/16 DIA.
CONNECTO
R-F PLUG UG
HEATED AIR DISCHARGES THIS END OF CASE
CONNECTO
PLUG AN3
HEAT EXCHANGER EXHAUST
4 1/4
SAFET
KNURL
MTG.
1 1/2
17 1/2
1 1/2

Radio Receiver-Transmitter RT-128A/ARC-21

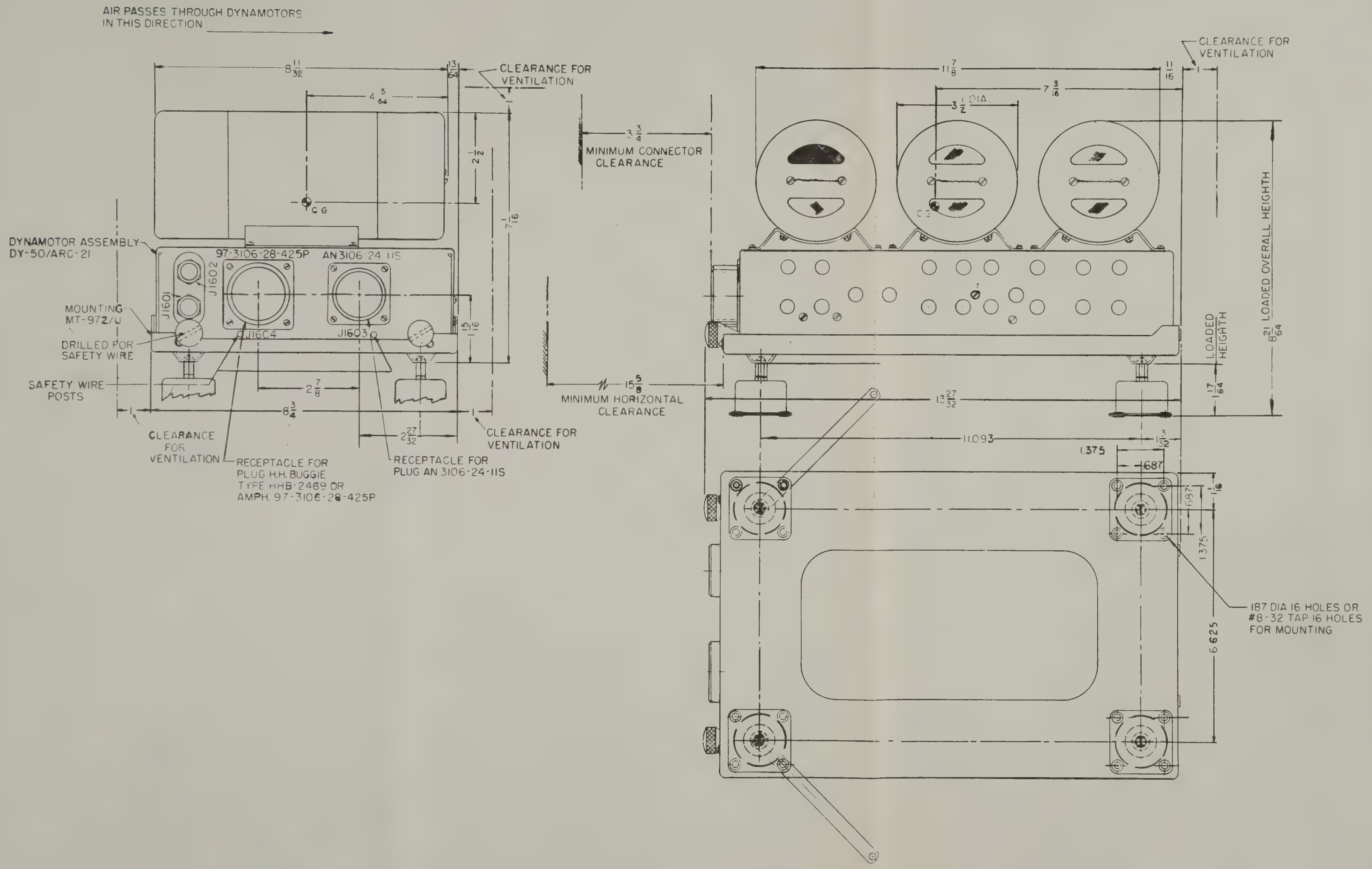

AIR PASSES THROUGH DYNAMOTORS IN THIS DIRECTION
$8\frac{11}{32}$
$\frac{13}{64}$
CLEARANCE FOR VENTILATION
$4\frac{5}{64}$
$2\frac{1}{2}$
$7\frac{1}{16}$
CG
DYNAMOTOR ASSEMBLY DY-50/ARC-21
97-3106-28-425P
AN3106-24-11S
J1601
J1602
J1604
J1603
MOUNTING MT-972/U
DRILLED FOR SAFETY WIRE
SAFETY WIRE POSTS
$\frac{15}{16}$
$2\frac{7}{8}$
$8\frac{3}{4}$
1
$2\frac{27}{32}$
CLEARANCE FOR VENTILATION
CLEARANCE FOR VENTILATION
RECEPTACLE FOR PLUG H.H. BUGGIE TYPE HHB-2469 OR AMPH. 97-3106-28-425P
RECEPTACLE FOR PLUG AN 3106-24-11S
$3\frac{3}{4}$
MINIMUM CONNECTOR CLEARANCE
$15\frac{5}{8}$
MINIMUM HORIZONTAL CLEARANCE
$11\frac{7}{8}$
$7\frac{3}{16}$
$3\frac{1}{2}$ DIA.
$\frac{11}{16}$
CLEARANCE FOR VENTILATION
1
CG
LOADED HEIGHTH
$8\frac{21}{64}$ LOADED OVERALL HEIGHTH
$1\frac{17}{64}$
$13\frac{27}{32}$
11.093
$1\frac{3}{32}$
1.375
.687
.687
$1\frac{1}{16}$
1.375
.187 DIA 16 HOLES OR #8-32 TAP 16 HOLES FOR MOUNTING
6.625

Figure 2-4. Mounting Dimensions, Dynamotor Assembly DY-50/ARC-21

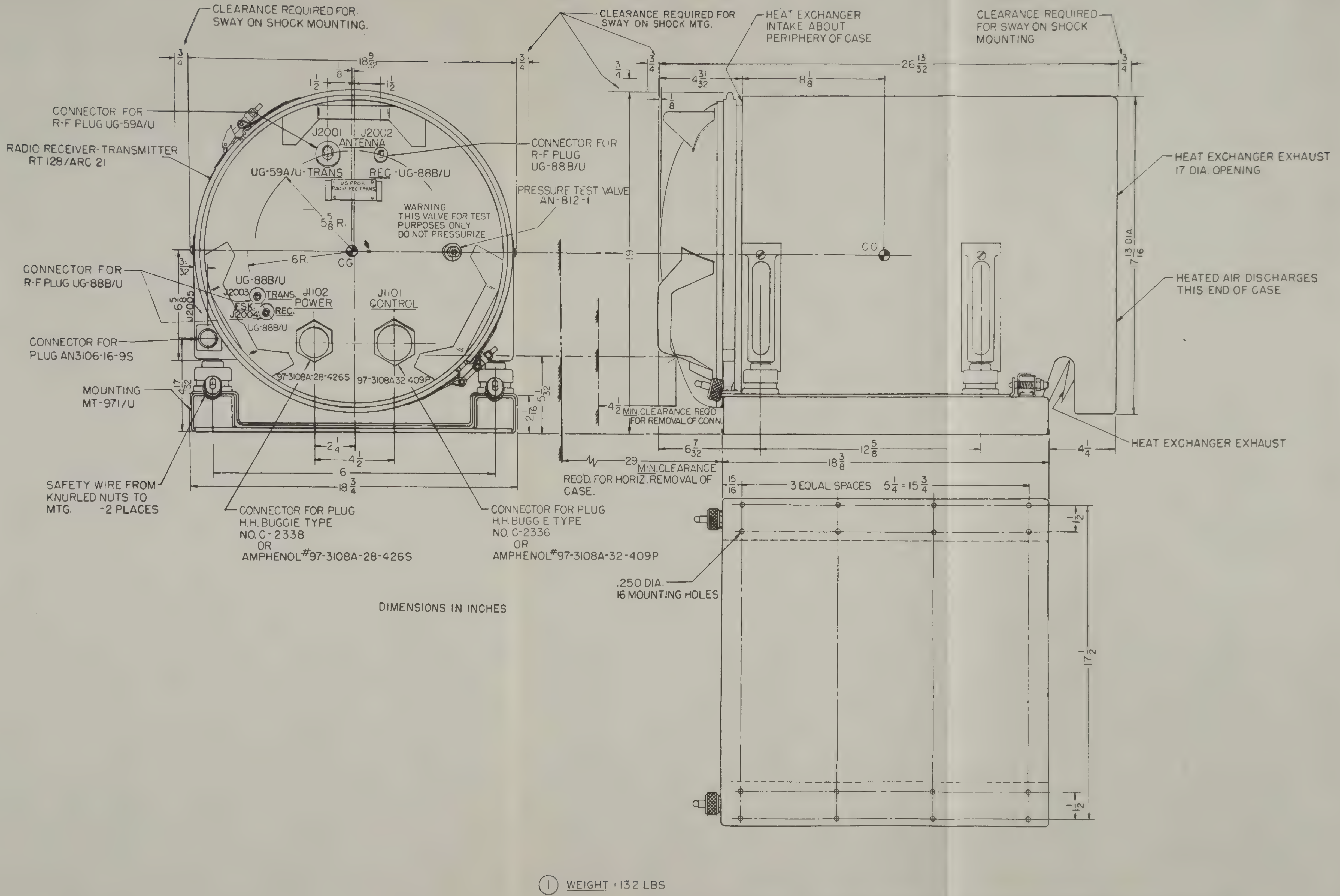
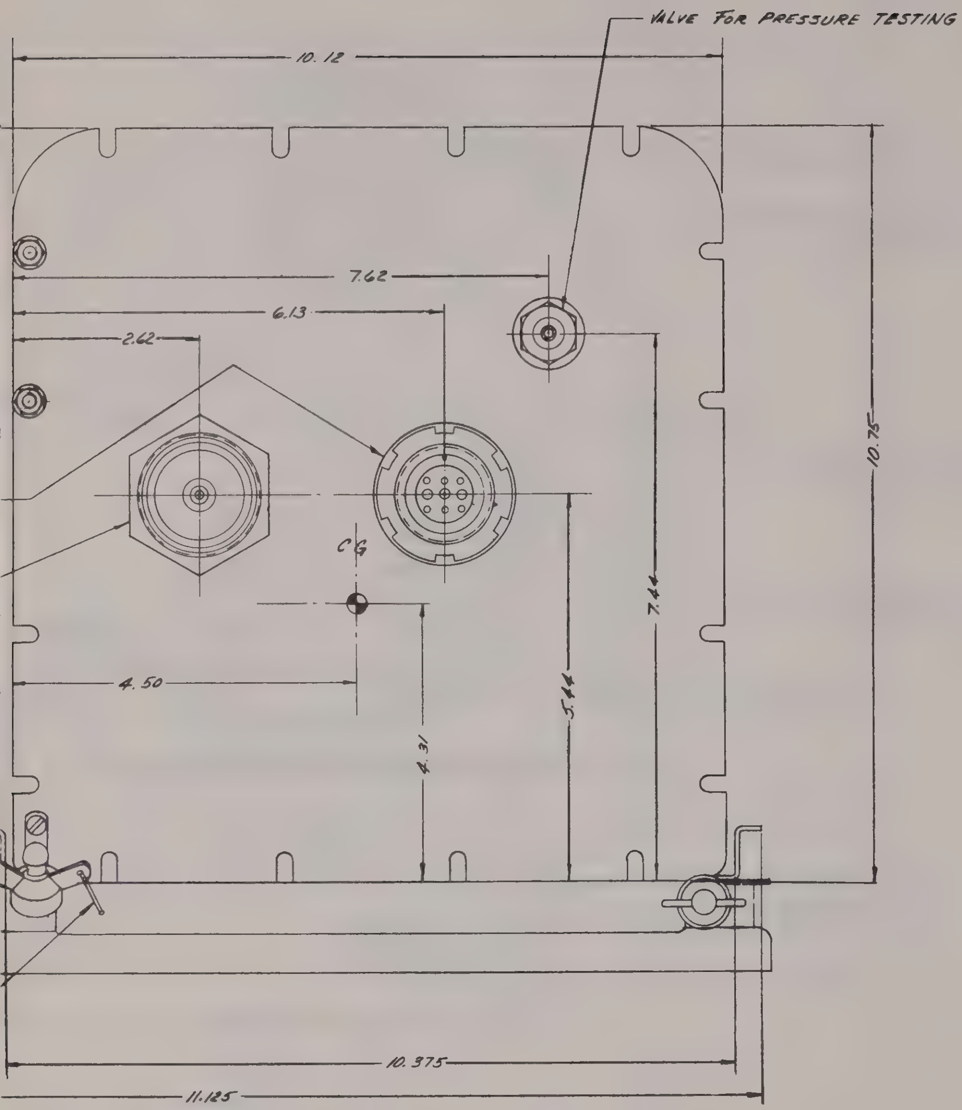

CLEARANCE REQUIRED FOR SWAY ON SHOCK MOUNTING.
$\frac{3}{4}$
$18\frac{9}{32}$
$\frac{1}{8}$
$1\frac{1}{2}$
$1\frac{1}{2}$
CONNECTOR FOR R-F PLUG UG-59A/U
RADIO RECEIVER-TRANSMITTER RT 128/ARC 21
J2001
J2002
ANTENNA
UG-59A/U-TRANS
REC-UG-88B/U
U.S. PROP. RADIO REC TRANS
$5\frac{5}{8}$ R.
WARNING THIS VALVE FOR TEST PURPOSES ONLY DO NOT PRESSURIZE
CONNECTOR FOR R-F PLUG UG-88B/U
PRESSURE TEST VALVE AN-812-1
6R.
CG
$\frac{31}{32}$
CONNECTOR FOR R-F PLUG UG-88B/U
UG-88B/U
J2003
TRANS.
FSK.
J2004
REC.
UG-88B/U
J1102 POWER
J1101 CONTROL
$6\frac{5}{8}$
J2005
CONNECTOR FOR PLUG AN3106-16-9S
97-3108A-28-426S
97-3108A32-409P
MOUNTING MT-971/U
$4\frac{17}{32}$
$5\frac{1}{32}$
$2\frac{1}{16}$
$2\frac{1}{4}$
$4\frac{1}{2}$
16
$18\frac{3}{4}$
SAFETY WIRE FROM KNURLED NUTS TO MTG. -2 PLACES
CONNECTOR FOR PLUG H.H. BUGGIE TYPE NO. C-2338 OR AMPHENOL #97-3108A-28-426S
CONNECTOR FOR PLUG H.H. BUGGIE TYPE NO. C-2336 OR AMPHENOL #97-3108A-32-409P
DIMENSIONS IN INCHES
CLEARANCE REQUIRED FOR SWAY ON SHOCK MTG.
HEAT EXCHANGER INTAKE ABOUT PERIPHERY OF CASE
CLEARANCE REQUIRED FOR SWAY ON SHOCK MOUNTING
$26\frac{13}{32}$
$4\frac{31}{32}$
$8\frac{1}{8}$
$\frac{1}{8}$
19
C G
$17\frac{13}{16}$ DIA.
HEAT EXCHANGER EXHAUST 17 DIA. OPENING
HEATED AIR DISCHARGES THIS END OF CASE
$4\frac{1}{2}$ MIN. CLEARANCE REQ'D FOR REMOVAL OF CONN.
HEAT EXCHANGER EXHAUST
$6\frac{7}{32}$
$12\frac{5}{8}$
$4\frac{1}{4}$
29 MIN. CLEARANCE REQ'D. FOR HORIZ. REMOVAL OF CASE.
$18\frac{3}{8}$
$\frac{15}{16}$
3 EQUAL SPACES $5\frac{1}{4} = 15\frac{3}{4}$
$1\frac{1}{2}$
.250 DIA. 16 MOUNTING HOLES
$17\frac{1}{2}$
$1\frac{1}{2}$
① WEIGHT = 132 LBS

Figure 2-5. Mounting Dimensions, Radio Receiver-Transmitter RT-128A/ARC-21


VALVE FOR PRESSURE TESTING
10.12
7.62
6.13
2.62
10.75
7.44
C G
5.44
4.31
4.50
10.375
11.125

NOTES:
1. SWAY SPACE, SIDE, TOP, AND REAR TO BE 1"
2. WEIGHT OF POWER SUPPLY APPROX. 31#
   WEIGHT OF SHOCK MOUNT 2.25#
3. ALL DIMENSIONS ARE IN INCHES.

2-13. RELAY, SOLENOID RE-132/ARC AND ADAPTER, KEYER GROUP MX-1394/ARC-21. These units are packed individually and in quantity. The unpacking procedure covers first the quantity unpacking and then the individual unpacking. Cut the iron bands with metal shears or hammer and chisel. These bands will not be usable again on cartons this size. Slit the tape sealing the top center and the ends of the top flaps of the carton. Open the flaps, prying with a wide blade knife if pasted shut, so as not to damage the flaps. Remove the individual cartons.

2-14. Open the top of the individual cartons by slitting the sealing tape around the edges of the top flaps and across the center of the carton top. Slide the contents out of the carton and open the moisture barrier at the top. Remove the carton and open by slitting the sealing tape at one end along the edges of the flaps and center of carton top. Remove the adapter or relay and antenna sleeve from the carton. Reassemble the packing material and store for future use.

2-15. SPARE CHASSIS. The spare chassis are shipped in round, reusable, sealed metal containers of appropriate size. The chassis are mounted in a wooden cradle nested in rubberized hair. To unpack, first break the lead and wire seal through the ends of the clamping ring. Next remove the nut from the clamping bolt and spread the clamping ring and lift it off the container. Remove the lid from the container, prying it loose from the container with a screwdriver if necessary, being careful not to damage the gasket. Carefully slide the internal packing on the bench and turn upright.

2-16. The internal packing consists of rubberized hair surrounding a wooden framework carrying the spare chassis. First remove the rubberized hair packing from the wooden cradle and sit the cradle upright on the bench. Three methods of holding the spare chassis in the cradle are used, one of the three being a combination of the other two. The first type uses the mounting screws of the spare chassis to hold it to the wooden cradle. This type can readily be identified by holes in the top to give screwdriver access to the captive chassis mounting screws. Removal of chassis requires unscrewing of the captive mounting screws and lifting the chassis out of the cradle.

2-17. The second type has a top sliding in grooves to hold the chassis in place. Slide the cover out of the wooden cradle and lift the spare chassis out of the cradle. The third type has a sliding cover and uses two captive chassis mounting screws to hold the spare chassis in the cradle. First remove the sliding top, then unscrew the two captive screws and lift the spare chassis out of the cradle. Replace the packing in the original container and mark with type number of chassis for future reshipment use.

2-18. INSPECTION.

2-19. After unpacking, check the various pieces of equipment for damage that may have occurred during shipment. Remove the cover at the rear of Radio Set Control C-451A/ARC-21 (see figure 2-2) and check for broken wires or other mechanical damage. Check the power supply for broken wires or mechanical damage.

Visually inspect the power supply. Remove the top from PP-298/ARC-21X and check for broken or defective parts. If Power Supply PP-1831/ARC is to be used, release any air pressure by unscrewing the pressure release valve visible on figure 2-5A. Set the power supply on its back and loosen (do not remove) the 10-32 u-bolt nuts. Lift the u-bolts out of their slot positions. (Refer to warning.) After removed, inspect the power supply for broken, burnt, or otherwise defective parts.

WARNING

> Equalize the air pressure before attempting to remove the chassis of Power Supply PP-1831/ARC from its pressurized case. The power supply weighs approximately 31 pounds. Two men are required to remove the chassis from the case, one to support the chassis while the other lifts it vertically out of the case.

2-20. Remove Radio Receiver-Transmitter RT-128A/ARC-21 (see figure 2-5) from its case and check that the tubes are not broken and are in place. Check for visible mechanical damage. Remove the Radio Receiver-Transmitter RT-128A/ARC-21 chassis from the case by FIRST RELEASING ANY AIR PRESSURE and then removing the clamping ring at the front of the case. If two men are available to remove the chassis from the case, set the equipment on its back and loosen the clamping ring. Grasp the handles and lift the chassis vertically out of the heat exchanger. If only one man is available, roll the unit over to stand it on the three handles. Remove the clamping to stand it on the three handles. Remove the clamping ring and pull the heat exchanger vertically off the chassis. Remove the clamping ring as follows: Unscrew the nut on the larger of the two clamps which hold the clamping ring, until the tension is released. The clamp can now be broken open with an outward thumb pressure between the clamping bolt and the clamping ring. The clamping ring can now be removed.

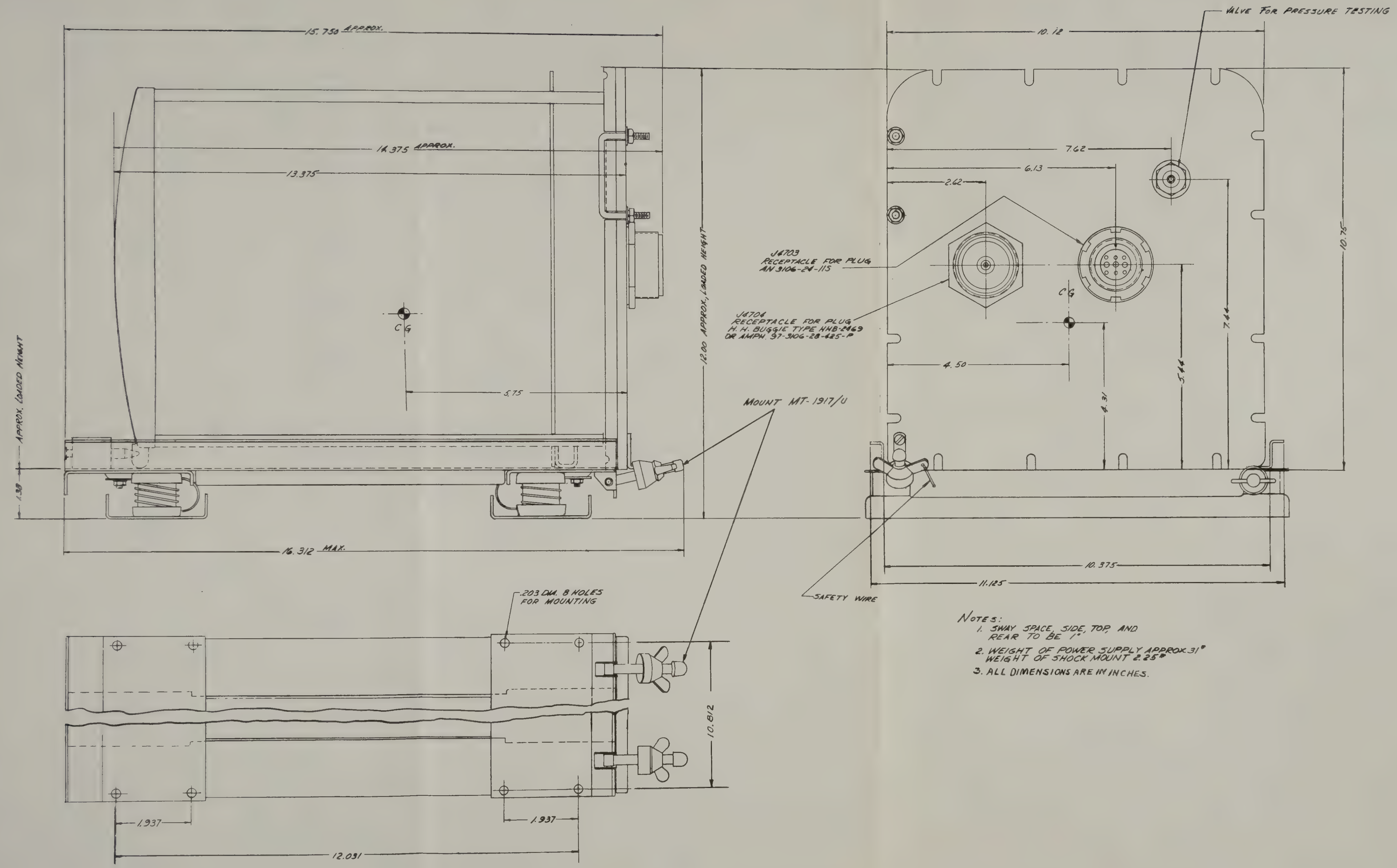
WARNING

> Two men are required to handle the receiver-transmitter when removed from the case, one to support it at the front end and one to support it at the rear.

2-21. Remove the cover of Adapter, Keyer Group MX-1394/ARC-21. Check for broken leads and damaged parts. The cover is held in place by 14 button head screws. On Mounting MT-1555/U check the jack, variable resistor and wiring for electrical and mechanical damage. Check the remainder of the mountings for mechanical damage.

2-22. SETTING ADAPTER, KEYER GROUP MX-1394/ARC-21.

2-23. Adapter, Keyer Group MX-1394/ARC-21 is set to tune the Receiver-Transmitter RT-128A/ARC-21 to a frequency of 8634 kilocycles. If another


VALVE FOR PRESSURE TESTING
15.750 APPROX.
14.375 APPROX.
13.375
10.12
7.62
6.13
2.62
J4703
RECEPTACLE FOR PLUG
AN 3106-24-11S
J4704
RECEPTACLE FOR PLUG
H. H. BUGGIE TYPE HHB-2469
OR AMPH. 97-3106-28-425-P
C G
C G
5.75
4.50
4.31
5.44
7.44
10.75
12.00 APPROX., LOADED HEIGHT
APPROX. LOADED HEIGHT
1.38
MOUNT MT-1917/U
16.312 MAX.
10.375
11.125
SAFETY WIRE
.203 DIA. 8 HOLES
FOR MOUNTING
10.812
1.937
1.937
12.031

NOTES:
1. SWAY SPACE, SIDE, TOP, AND REAR TO BE 1"
2. WEIGHT OF POWER SUPPLY APPROX. 31#
WEIGHT OF SHOCK MOUNT 2.25#
3. ALL DIMENSIONS ARE IN INCHES.

Figure 2-5A. Mounting Dimensions, Power Supply PP-1831/ARC

2-13. RELAY, SOLENOID RE-132/ARC AND ADAPTER, KEYER GROUP MX-1394/ARC-21. These units are packed individually and in quantity. The unpacking procedure covers first the quantity unpacking and then the individual unpacking. Cut the iron bands with metal shears or hammer and chisel. These bands will not be usable again on cartons this size. Slit the tape sealing the top center and the ends of the top flaps of the carton. Open the flaps, prying with a wide blade knife if pasted shut, so as not to damage the flaps. Remove the individual cartons.

2-14. Open the top of the individual cartons by slitting the sealing tape around the edges of the top flaps and across the center of the carton top. Slide the contents out of the carton and open the moisture barrier at the top. Remove the carton and open by slitting the sealing tape at one end along the edges of the flaps and center of carton top. Remove the adapter or relay and antenna sleeve from the carton. Reassemble the packing material and store for future use.

2-15. SPARE CHASSIS. The spare chassis are shipped in round, reusable, sealed metal containers of appropriate size. The chassis are mounted in a wooden cradle nested in rubberized hair. To unpack, first break the lead and wire seal through the ends of the clamping ring. Next remove the nut from the clamping bolt and spread the clamping ring and lift it off the container. Remove the lid from the container, prying it loose from the container with a screwdriver if necessary, being careful not to damage the gasket. Carefully slide the internal packing on the bench and turn upright.

2-16. The internal packing consists of rubberized hair surrounding a wooden framework carrying the spare chassis. First remove the rubberized hair packing from the wooden cradle and sit the cradle upright on the bench. Three methods of holding the spare chassis in the cradle are used, one of the three being a combination of the other two. The first type uses the mounting screws of the spare chassis to hold it to the wooden cradle. This type can readily be identified by holes in the top to give screwdriver access to the captive chassis mounting screws. Removal of chassis requires unscrewing of the captive mounting screws and lifting the chassis out of the cradle.

2-17. The second type has a top sliding in grooves to hold the chassis in place. Slide the cover out of the wooden cradle and lift the spare chassis out of the cradle. The third type has a sliding cover and uses two captive chassis mounting screws to hold the spare chassis in the cradle. First remove the sliding top, then unscrew the two captive screws and lift the spare chassis out of the cradle. Replace the packing in the original container and mark with type number of chassis for future reshipment use.

2-18. INSPECTION.

2-19. After unpacking, check the various pieces of equipment for damage that may have occurred during shipment. Remove the cover at the rear of Radio Set Control C-451A/ARC-21 (see figure 2-2) and check for broken wires or other mechanical damage. Check the power supply for broken wires or mechanical damage.

Visually inspect the power supply. Remove the top from PP-298/ARC-21X and check for broken or defective parts. If Power Supply PP-1831/ARC is to be used, release any air pressure by unscrewing the pressure release valve visible on figure 2-5A. Set the power supply on its back and loosen (do not remove) the 10-32 u-bolt nuts. Lift the u-bolts out of their slot positions. (Refer to warning.) After removed, inspect the power supply for broken, burnt, or otherwise defective parts.

WARNING

> Equalize the air pressure before attempting to remove the chassis of Power Supply PP-1831/ARC from its pressurized case. The power supply weighs approximately 31 pounds. Two men are required to remove the chassis from the case, one to support the chassis while the other lifts it vertically out of the case.

2-20. Remove Radio Receiver-Transmitter RT-128A/ARC-21 (see figure 2-5) from its case and check that the tubes are not broken and are in place. Check for visible mechanical damage. Remove the Radio Receiver-Transmitter RT-128A/ARC-21 chassis from the case by FIRST RELEASING ANY AIR PRESSURE and then removing the clamping ring at the front of the case. If two men are available to remove the chassis from the case, set the equipment on its back and loosen the clamping ring. Grasp the handles and lift the chassis vertically out of the heat exchanger. If only one man is available, roll the unit over to stand it on the three handles. Remove the clamping to stand it on the three handles. Remove the clamping ring and pull the heat exchanger vertically off the chassis. Remove the clamping ring as follows: Unscrew the nut on the larger of the two clamps which hold the clamping ring, until the tension is released. The clamp can now be broken open with an outward thumb pressure between the clamping bolt and the clamping ring. The clamping ring can now be removed.

WARNING

> Two men are required to handle the receiver-transmitter when removed from the case, one to support it at the front end and one to support it at the rear.

2-21. Remove the cover of Adapter, Keyer Group MX-1394/ARC-21. Check for broken leads and damaged parts. The cover is held in place by 14 button head screws. On Mounting MT-1555/U check the jack, variable resistor and wiring for electrical and mechanical damage. Check the remainder of the mountings for mechanical damage.

2-22. SETTING ADAPTER, KEYER GROUP MX-1394/ARC-21.

2-23. Adapter, Keyer Group MX-1394/ARC-21 is set to tune the Receiver-Transmitter RT-128A/ARC-21 to a frequency of 8634 kilocycles. If another frequency is desired, the frequency control leads must be changed. Proceed as follows:

a. Remove the 14 screws holding the cover and slide the cover off.

b. Unsolder the lead connected to the terminal stencilled 8 on terminal E3001 and solder it to the terminal stencilled with the number of thousands of kilocycles desired in the new frequency.

c. Next unsolder the lead connected to the terminal stencilled 3 on the hundreds end of terminal board E3002 and solder it to the terminal of its group stencilled with the number of hundreds of kilocycles desired in the new frequency.

d. On the other half of the same terminal board unsolder the lead to the terminal stencilled 6 and solder it to the terminal stencilled with the number of the tens of kilocycles desired in the new frequency.

e. Unsolder the lead connected to the terminal stencilled 4 on terminal board E3003 and solder it to the terminal stencilled with the number of units and half units of kilocycles desired in the new frequency.

f. Replace the cover and the Adapter, Keyer Group MX-1394/ARC-21 is ready for operation on the new frequency.

2-24. BENCH TEST.

2-25. Connect the equipment for a bench test with the Dummy Load DA-72/U as described in Section VI. The dummy load should be connected to the output jack of the ERA Coupler. Remove the receiver-transmitter from its case and place it on the Stand, Maintenance, Receiver-Transmitter MT-1164/U.

2-26. BRIDGE POWER LINE ADJUSTMENT. Mounting MT-1555/U for Adapter, Keyer Group MX-1394/ARC-21 contains variable resistor R3401 to compensate for the difference in resistance of the bridge power lines to Radio Set Control C-451A/ARC-21. Use the following procedure for adjusting resistor R3401:

a. Check the resistance in a number of aircraft with an operating system for an average resistance value for the bridge power circuit. Set resistor to zero resistance. Disconnect P2107 from Radio Set Control C-451A/ARC-21 and ground pins H and M.

b. Remove plug P2105 from Receiver-Transmitter RT-128A/ARC-21. Connect one side of a Wheatstone or Kelvin bridge to pins D and AA and the other side of the bridge to the aircraft structure. Measure the resistance.

c. Check this circuit value in a number of aircraft so an average value can be calculated for one type of aircraft. The resistance value must not exceed 0.4 ohm nor vary more than 0.1 ohm between aircraft.

d. Remove ground from pins H and M of plug P2107 and replace on Radio Set Control C-451A/ARC-21. Remove plug P2140 from Adapter, Keyer Group MX-1394/ARC-21 and ground pins A and J to the aircraft structure.

e. Measure the resistance of this circuit. It should not be more than 0.1 ohm.

f. Check these same circuits in the bench test set-up and add resistance to each until it equals the average value of the aircraft wiring as calculated. Remove ground from pins A and J of plug P2140 and plug into jack J3001 of Adapter Keyer Group MX-1394/ARC-21.

g. Connect a Wheatstone or Kelvin bridge between pins D and AA of plug P2105 on Receiver-Transmitter RT-128A/ARC-21 and pins H and M of plug P2107 on Radio Set Control C-451A/ARC-21. Adjust resistor R3401 in Mounting MT-1555/U to give a circuit resistance of 0.88 ±0.020 ohm.

NOTE

Whenever the Adapter, Keyer Group MX-1394/ARC-21 is part of the measured circuit be sure it is in the "normal operation" condition. This can be checked by turning on the 27.5 volt supply with all units connected in the bench set-up and Control Panel C-790/ARA-26 in the "OFF" position. Resistor R620, located in Selector Control Subassembly MX-1425A/ARC-21 is set at 1 ohm for chassis not stamped M1 and fully clockwise for chassis stamped M1.

2-27. SETTING RADIO SET CONTROL C-451A/ARC-21. Test frequencies must be set up on the radio set control. Steps a through k below describe the procedure for setting up these test frequencies in Radio Set Control C-451A/ARC-21. (See table VIII.)

a. On Radio Set Control C-451A/ARC-21, set the control knob to "OFF."

b. Unscrew the two knurled-head captive screws which hold the drum covers in position. Open the covers to expose the drums.

c. Turn the "CHANNEL" knob until the desired channel number appears at the left side of the selector drum. Disregard the "CHANNEL" indication when presetting frequencies on the selector drums.

d. Remove the setting tool from the clip on the top cover.

e. By means of the setting tool, move the four buttons, one at a time, to proper position under the respective numbers. This is done by inserting the socket end of the tool over the buttons and sliding them sidewise to the proper number.

f. Move the top-drum left-hand button under the figure representing the thousands of kilocycles of the frequency being set.

g. Set the right-hand button on the top drum under the number of hundreds of kilocycles.

h. Set the left-hand button on the button drum under the number of tens of kilocycles.

i. Set the right-hand button on the button drum under the number of units and halves of kilocycles.

j. Turn the "CHANNEL" knob to the next channel to be set and set the corresponding buttons in the same manner as just described.

k. Replace drum covers to operating position.

2-28. SYSTEM CHECK. The operation of the transmitter and receiver may now be checked on each of the four frequencies previously set on Radio Set Control C-451A/ARC-21. All control functions are initiated at Radio Set Control C-451A/ARC-21. Proceed as follows:

a. Turn the equipment on by placing the "CONTROL" switch in the "ON" position after checking that the primary power source voltages are within ±5 percent of nominal. (See table VI.) Allow 40 seconds for warm-up and receiver tuning.

b. Set the "CW SHARP-CW BROAD-VOICE-FSK" switch to "CW BROAD" and listen to the receiver

TABLE VIII. CHANNEL SETTINGS FOR INITIAL BENCH TEST

Channel in Radio Set Control C-451A/ARC-21	Frequency (kc)
1	3500
2	7000
3	12500
4	20000

background noise which should be normal.

c. Switch to the "CW SHARP" position. The receiver background noise should be less due to the narrower bandwidth.

d. Adjust the "VOLUME" control throughout its range. Counterclockwise rotation should reduce signal level to a minimum. Clockwise rotation should raise the receiver signal level.

e. Switch to "CW BROAD" while receiving a signal and check the range of the "CW TUNE" control. This should vary the pitch of the beat note over a considerable range.

f Hold the key down and watch Amplifier, Radio Frequency AM-774A/ARC-21 in Radio Receiver-Transmitter RT-128A/ARC-21 tune, then the ERA Coupler, and then Amplifier, Radio Frequency AM-774A/ARC-21. Keying sidetone should be heard in the headset after completion of the tuning cycle. Note meter indication on Dummy Load DA-72/U.

g. Change the "CW SHARP-CW BROAD-VOICE-FSK" switch to "VOICE." Apply Interference Generator SG-23/U to the antenna input, jack J2002, and adjust generator attenuator for sufficient input signal to open the squelch. Adjust the "NOISE" control over its range. At the clockwise position the receiver background noise should be at maximum, diminishing as the control is turned counterclockwise. Return the "NOISE" control to the clockwise position.

h. Adjust "VOLUME" control over its range as in step d.

i. With the microphone push-to-talk button released, change the "POWER" switch from "HI to LOW." Press the "push-to-talk" button. The indication on the meter of the dummy load should be considerably less than it was in step f. Voice sidetone should be heard when talking into the microphone.

CAUTION

> Do not operate the "POWER" switch while the transmitter is operating.

j. With "CW SHARP-CW BROAD-VOICE-FSK" switch on "CW BROAD" change the "CHANNEL" to "2." Listen for the receiver background noise. When it is heard, indicating receiver tune-up is complete, press the key and wait for tune-up to be completed. This will be indicated by cw sidetone and the reading of the meter of the dummy load.

k. Check channels 3 and 4 as given in step j.

l. Check the panel lamps by removing all but one, and, if it is lighted, remove it and insert another repeating the process until all the lamps are checked. Return all lamps to their sockets. This procedure is necessary since the light from each lamp helps to illuminate the entire panel, otherwise making it difficult to locate a defective lamp.

m. On systems using the Control, Keyer Group AN/ARA-26 the test consists of lifting the red cover over toggle switch and switching toggle switch to "ON" on Control Panel C-790/ARA-26. The receiver-transmitter should tune to the emergency frequency and send out coded signals produced by Keyer KY-65/ARA-26.

2-29. If Control Panel C-790/ARA-26 and Keyer KY-65/ARA-26 are suspected of trouble see the subject instruction manual.

2-30. REPLACING PANEL LAMPS. Unscrew the panel lamp cap from the panel and extract the lamp from the inside end of the cap. Use fingernails or knife blade to get under lamp base and pull outward. Push new lamp in position and replace cap.

2-31. PREPARATION FOR INSTALLATION. Set up the 20 channels in the Radio Set Control C-451A/ARC-21 on the frequencies to be used. Return the units to their cases and replace the engraved plates in the frame on the coupler panel so the plate corresponding to the coder setting is visible.

2-32. Prepare Case, Receiver-Transmitter CY-1279A/ARC-21 for assembly by screwing the dehydrator in the bracket inside the rear of the case. The protective cap must be removed from the dehydrator before this can be done. Next stand the case on its back and smooth the gasket around the case opening. Slide the receiver-transmitter chassis in the case and fasten the clamping ring. Tap the clamping ring lightly around the circumference to assist in seating during the tightening operation to assure a good seal. Pressurize in accordance with instructions on the case. Check that the frequency set up in the Adapter, Keyer Group MX-1394/ARC-21 is correct.

2-33. INSTALLATION.

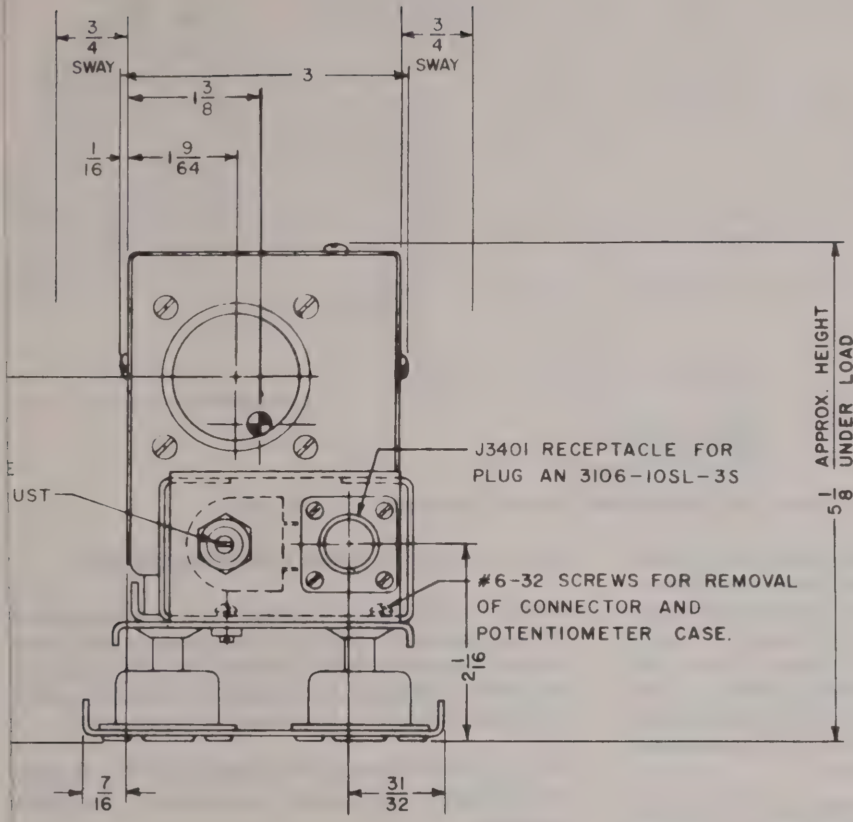
2-34. Radio Set AN/ARC-21 is to be installed either in an aircraft which has the necessary cabling installed as part of the aircraft wiring system, or as a ground equipment with cabling to be made up similar to that used in the bench test set-up. Installation consists of installing the receiver-transmitter and power supply mountings, mounting the units and connecting them. When the installation includes Emergency Keyer AN/ARA-26, the keyer, control panel, adapter and their mountings must be installed and connected.

2-35. INSTALLATION OF MOUNTINGS.

2-36. MOUNTING MT-971/U. This mounting holds the receiver-transmitter in place and must be located in such a position as to allow for reasonable slack in the connecting cables. Hold the mounting in place by means of sixteen 1/4-inch bolts. Use the mounting as a template to lay out the locations of the holes. The aircraft structure will determine the length of the bolts and type of fastening for the bolts. The importance of thorough, low-impedance ground bonding cannot be overemphasized.

2-37. MOUNTING MT-972/U. This mounting is used for either Dynamotor Assembly DY-50/ARC-21 or Power Supply PP-298/ARC-21X and uses sixteen 8-32 mounting bolts. Locate the mounting on aircraft structure so as to allow sufficient slack in the connecting cables. Type and length of bolts, and method of fastening, depend on the aircraft structure. The importance of thorough, low-impedance ground bonding cannot be overemphasized.

2-37A. MOUNTING MT-1917/U. This mounting, see figure 2-5A, is used to mount Power Supply PP-1831/ARC. For location and grounding instructions see paragraph 2-37.


3/4 SWAY
3
1 3/8
1/16
1 9/64
3/4 SWAY
5 1/8 APPROX. HEIGHT UNDER LOAD
J3401 RECEPTACLE FOR PLUG AN 3106-10SL-3S
E
UST
#6-32 SCREWS FOR REMOVAL OF CONNECTOR AND POTENTIOMETER CASE.
2 1/16
7/16
31/32

NOTES

1. SET POTENTIOMETER R3401 TO OBTAIN 0.88 OHM ±0.01 OHM (MEASURED BY A WHEATSTONE BRIDGE) BETWEEN PINS D AND AA OF CONNECTOR 97-3108-32-409P AT RT-128/ARC-21, AND PINS H AND M OF CONNECTOR AN3108-20-27S AT C451/ARC-21. NOTE IN THIS APPLICATION PINS D AND AA OF CONNECTOR 97-3108-32-409P ARE CONNECTED TOGETHER, AND PINS H AND M OF CONNECTOR AN3108-20-27S ARE CONNECTED TOGETHER. IN ORDER TO SIMPLIFY MEASUREMENT ONE SET OF PINS SHOULD BE GROUNDED AND MEASUREMENT TAKEN BETWEEN THE OTHER SET OF PINS AND GROUND. CAUTION VERY LOW CONTACT RESISTANCE IS REQUIRED IN THIS MEASUREMENT.

2. WHEN CHANGING MT-1555/U AFTER POTENTIOMETER R3104 HAS BEEN ADJUSTED, REMOVE THE CASE HOLDING R3104 AND J3104 AND ATTACH TO NEW MOUNT WITHOUT DISTURBING THE SETTING OF POTENTIOMETER.

DIMENSIONS IN INCHES

Figure 2-6. Mounting Dimensions, Adapter, Keyer Group MX-1394/ARC-21

background noise which should be normal.

c. Switch to the "CW SHARP" position. The receiver background noise should be less due to the narrower bandwidth.

d. Adjust the "VOLUME" control throughout its range. Counterclockwise rotation should reduce signal level to a minimum. Clockwise rotation should raise the receiver signal level.

e. Switch to "CW BROAD" while receiving a signal and check the range of the "CW TUNE" control. This should vary the pitch of the beat note over a considerable range.

f Hold the key down and watch Amplifier, Radio Frequency AM-774A/ARC-21 in Radio Receiver-Transmitter RT-128A/ARC-21 tune, then the ERA Coupler, and then Amplifier, Radio Frequency AM-774A/ARC-21. Keying sidetone should be heard in the headset after completion of the tuning cycle. Note meter indication on Dummy Load DA-72/U.

g. Change the "CW SHARP-CW BROAD-VOICE-FSK" switch to "VOICE." Apply Interference Generator SG-23/U to the antenna input, jack J2002, and adjust generator attenuator for sufficient input signal to open the squelch. Adjust the "NOISE" control over its range. At the clockwise position the receiver background noise should be at maximum, diminishing as the control is turned counterclockwise. Return the "NOISE" control to the clockwise position.

h. Adjust "VOLUME" control over its range as in step d.

i. With the microphone push-to-talk button released, change the "POWER" switch from "HI to LOW." Press the "push-to-talk" button. The indication on the meter of the dummy load should be considerably less than it was in step f. Voice sidetone should be heard when talking into the microphone.

CAUTION

> Do not operate the "POWER" switch while the transmitter is operating.

j. With "CW SHARP-CW BROAD-VOICE-FSK" switch on "CW BROAD" change the "CHANNEL" to "2." Listen for the receiver background noise. When it is heard, indicating receiver tune-up is complete, press the key and wait for tune-up to be completed. This will be indicated by cw sidetone and the reading of the meter of the dummy load.

k. Check channels 3 and 4 as given in step j.

l. Check the panel lamps by removing all but one, and, if it is lighted, remove it and insert another repeating the process until all the lamps are checked. Return all lamps to their sockets. This procedure is necessary since the light from each lamp helps to illuminate the entire panel, otherwise making it difficult to locate a defective lamp.

m. On systems using the Control, Keyer Group AN/ARA-26 the test consists of lifting the red cover over toggle switch and switching toggle switch to "ON" on Control Panel C-790/ARA-26. The receiver-transmitter should tune to the emergency frequency and send out coded signals produced by Keyer KY-65/ARA-26.

2-29. If Control Panel C-790/ARA-26 and Keyer KY-65/ARA-26 are suspected of trouble see the subject instruction manual.

2-30. REPLACING PANEL LAMPS. Unscrew the panel lamp cap from the panel and extract the lamp from the inside end of the cap. Use fingernails or knife blade to get under lamp base and pull outward. Push new lamp in position and replace cap.

2-31. PREPARATION FOR INSTALLATION. Set up the 20 channels in the Radio Set Control C-451A/ARC-21 on the frequencies to be used. Return the units to their cases and replace the engraved plates in the frame on the coupler panel so the plate corresponding to the coder setting is visible.

2-32. Prepare Case, Receiver-Transmitter CY-1279A/ARC-21 for assembly by screwing the dehydrator in the bracket inside the rear of the case. The protective cap must be removed from the dehydrator before this can be done. Next stand the case on its back and smooth the gasket around the case opening. Slide the receiver-transmitter chassis in the case and fasten the clamping ring. Tap the clamping ring lightly around the circumference to assist in seating during the tightening operation to assure a good seal. Pressurize in accordance with instructions on the case. Check that the frequency set up in the Adapter, Keyer Group MX-1394/ARC-21 is correct.

2-33. INSTALLATION.

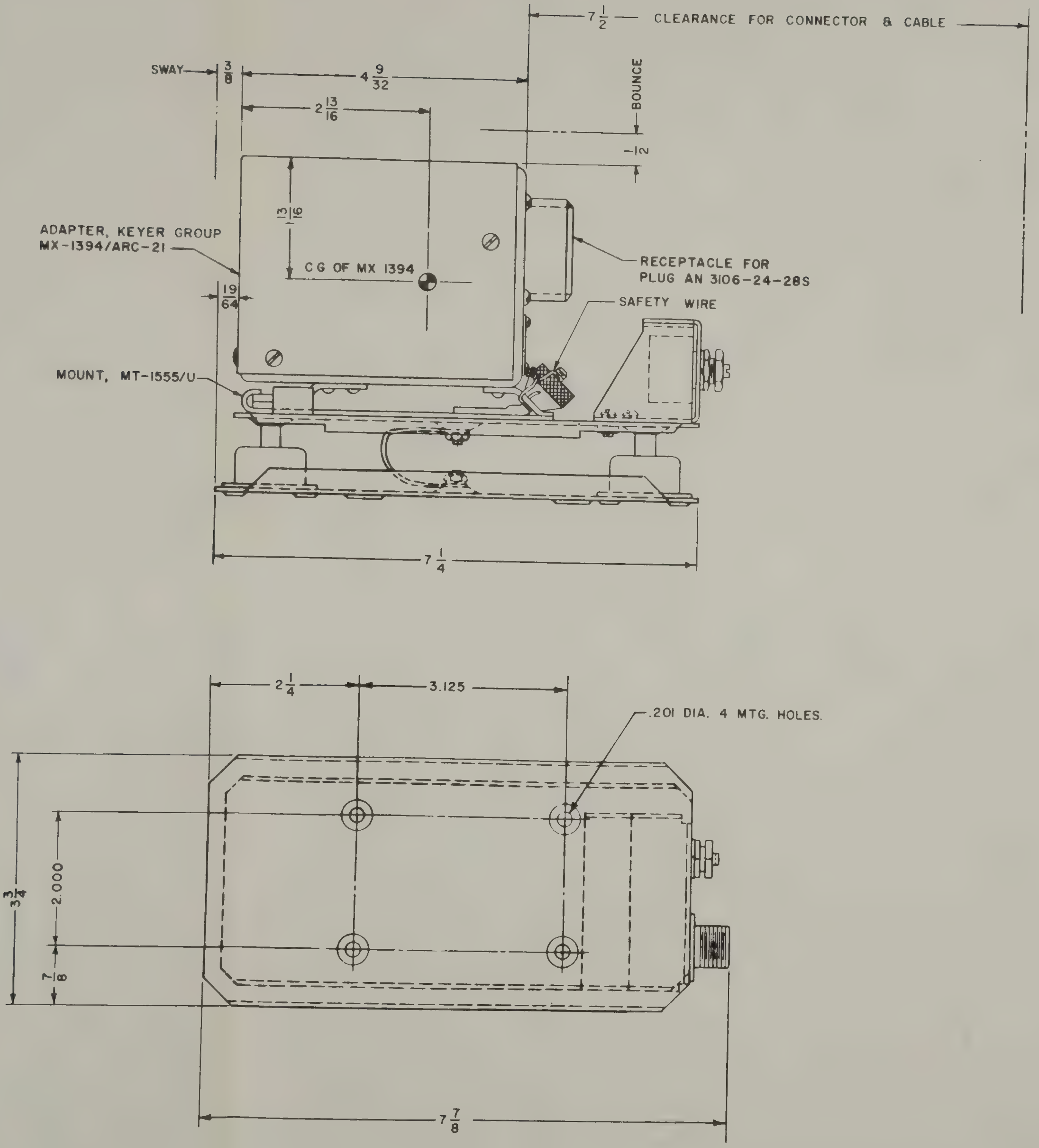
2-34. Radio Set AN/ARC-21 is to be installed either in an aircraft which has the necessary cabling installed as part of the aircraft wiring system, or as a ground equipment with cabling to be made up similar to that used in the bench test set-up. Installation consists of installing the receiver-transmitter and power supply mountings, mounting the units and connecting them. When the installation includes Emergency Keyer AN/ARA-26, the keyer, control panel, adapter and their mountings must be installed and connected.

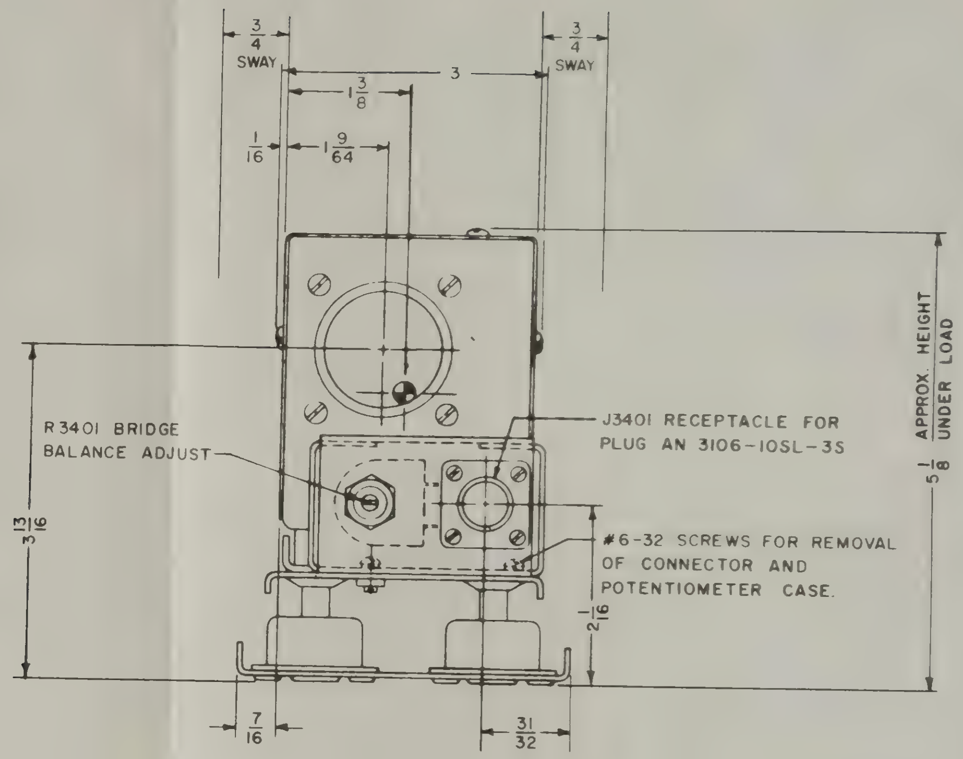
2-35. INSTALLATION OF MOUNTINGS.

2-36. MOUNTING MT-971/U. This mounting holds the receiver-transmitter in place and must be located in such a position as to allow for reasonable slack in the connecting cables. Hold the mounting in place by means of sixteen 1/4-inch bolts. Use the mounting as a template to lay out the locations of the holes. The aircraft structure will determine the length of the bolts and type of fastening for the bolts. The importance of thorough, low-impedance ground bonding cannot be overemphasized.

2-37. MOUNTING MT-972/U. This mounting is used for either Dynamotor Assembly DY-50/ARC-21 or Power Supply PP-298/ARC-21X and uses sixteen 8-32 mounting bolts. Locate the mounting on aircraft structure so as to allow sufficient slack in the connecting cables. Type and length of bolts, and method of fastening, depend on the aircraft structure. The importance of thorough, low-impedance ground bonding cannot be overemphasized.

2-37A. MOUNTING MT-1917/U. This mounting, see figure 2-5A, is used to mount Power Supply PP-1831/ARC. For location and grounding instructions see paragraph 2-37.


7 1/2 CLEARANCE FOR CONNECTOR & CABLE
SWAY 3/8
4 9/32
2 13/16
BOUNCE
1/2
1 3/16
ADAPTER, KEYER GROUP MX-1394/ARC-21
CG OF MX 1394
19/64
RECEPTACLE FOR PLUG AN 3106-24-28S
SAFETY WIRE
MOUNT, MT-1555/U
7 1/4
2 1/4
3.125
.201 DIA. 4 MTG. HOLES.
3 3/4
2.000
7/8
7 7/8


3/4 SWAY
3/4 SWAY
3
1 3/8
1/16
1 9/64
R3401 BRIDGE BALANCE ADJUST
J3401 RECEPTACLE FOR PLUG AN 3106-10SL-3S
#6-32 SCREWS FOR REMOVAL OF CONNECTOR AND POTENTIOMETER CASE.
3 13/16
2 1/16
5 1/8 APPROX. HEIGHT UNDER LOAD
7/16
31/32

NOTES

1. SET POTENTIOMETER R3401 TO OBTAIN 0.88 OHM ±0.01 OHM (MEASURED BY A WHEATSTONE BRIDGE) BETWEEN PINS D AND AA OF CONNECTOR 97-3108-32-409P AT RT-128/ARC-21, AND PINS H AND M OF CONNECTOR AN3108-20-27S AT C451/ARC-21. NOTE IN THIS APPLICATION PINS D AND AA OF CONNECTOR 97-3108-32-409P ARE CONNECTED TOGETHER, AND PINS H AND M OF CONNECTOR AN3108-20-27S ARE CONNECTED TOGETHER. IN ORDER TO SIMPLIFY MEASUREMENT ONE SET OF PINS SHOULD BE GROUNDED AND MEASUREMENT TAKEN BETWEEN THE OTHER SET OF PINS AND GROUND. CAUTION VERY LOW CONTACT RESISTANCE IS REQUIRED IN THIS MEASUREMENT.

2. WHEN CHANGING MT-1555/U AFTER POTENTIOMETER R3104 HAS BEEN ADJUSTED, REMOVE THE CASE HOLDING R3104 AND J3104 AND ATTACH TO NEW MOUNT WITHOUT DISTURBING THE SETTING OF POTENTIOMETER.

DIMENSIONS IN INCHES

Figure 2-6. Mounting Dimensions, Adapter, Keyer Group MX-1394/ARC-21

SECTION III

TEST EQUIPMENT AND TOOLS

3-1. TEST EQUIPMENT REQUIRED.

3-2. This section lists all test equipment and tools required for the disassembly, assembly, and testing of Radio Set AN/ARC-21. Common types of tools, such as screwdrivers, pliers, sidecutters and soldering irons are not listed but will be used at the discretion of the maintenance personnel.

3-3. Table IX lists test equipment required.

3-4. SPECIAL TOOLS REQUIRED.

3-5. Several special tools are required for the maintenance of the AN/ARC-21 equipment. The Bristo wrenches and nylon screwdriver listed in table X, are supplied mounted in clips fastened to the Chassis, Receiver-Transmitter MX-1424A/ARC-21. A duplicate screwdriver and set of wrenches are contained in Test Kit, Radio MK-136/ARC-21 as are also a number of test cables for connecting the chassis to the re-

TABLE IX. TEST EQUIPMENT REQUIRED

Figure No.	Name	AN Type Designation	Alternate Designation	Application
3-2	R-F Monitoring Probe and Extension Rod	ID-263/U O-904	------	Measuring transmitter output voltage.
3-6	Frequency Meter	FR-47/U	------	Check transmitter and receiver frequencies.
3-7	Oscilloscope	OS-8/U	------	Comparing frequencies and wave forms visually.
3-8	Multimeter	TS-352/U	------	Voltage, current, and resistance checks.
3-9	Voltmeter	TS-375/U	------	Measuring voltages in high impedance circuits.
3-10	Audio Oscillator	TS-382/U	------	Supply audio signals for audio and modulator tests.
3-5	Interconnecting Box	J-520/U	------	Power connections for power supply.
3-11	Signal Generator	TS-413/U	------	Supply r-f signals for receiver tests.
3-12	Dummy Load, Electrical	DA-72/U	------	Transmitter power output measurements.
3-13	Tube Tester	*TV-7/U	------	Checking condition of tubes.
3-1	Multimeter	ME-75/ARC-21	------	Measures voltages and currents.
3-15	Test Cradle	MT-1164/U	------	Supporting Radio Receiver-Transmitter RT-128A/ARC-21 during test.
3-16	Test Kit, Radio	MK-136/ARC-21	------	Extension cables and special tools.
3-20 3-21	**Bench Test Cable	------	------	Interconnection between units and power source.
3-17	Output Meter	TS-585/U	------	Measuring audio output power.
3-3	Dummy Load, Electrical	DA-84/ARM-6	------	Quick visual indication of transmitter power output.
3-4	Interference Generator	SG-23/U	------	Quick test of receiver sensitivity.
3-18	Dynamotor Test Set	TS-414/U	------	Dynamotor checks.
3-14	Multimeter	TS-297/U	------	General usage.

* Or I-177 Tube Tester and MX-949/U Tube socket adapter. (See figure 3-19.)

** See paragraphs 3-9 to 3-37 for cable fabrication.

TABLE X. TOOLS REQUIRED

Figure No.	Part Number	Name	Application
3-16, 8-2	------	Bristo No. 4 Wrench	For loosening and tightening Bristo No. 4 setscrews.
3-16, 8-2	------	Bristo No. 6 Wrench	For loosening and tightening Bristo No. 6 setscrews.
3-16, 8-2	------	Nylon Screwdriver	To adjust cores of coils during alignment.
3-16	------	Test Cables (See par. 2-10 for details on types.)	Connecting chassis to their respective jacks when removed for servicing.

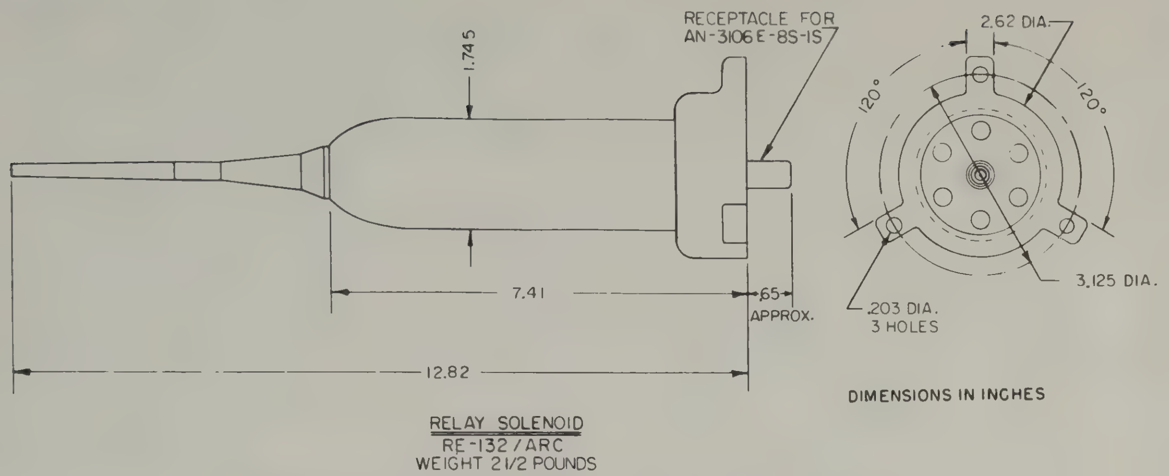


Figure 2-7. Mounting Dimensions, Relay, Solenoid RE-132/ARC

2-38. MOUNTING MT-1555/U. This mounting is used for mounting the Adapter, Keyer Group MX-1394/ARC-21. Four 10-32 mounting bolts are required. Locate the mounting on the aircraft structure so as to allow sufficient slack in the connecting cables. Type and length of bolts, and method of fastening, depend on the aircraft structure. The importance of thorough, low impedance ground bonding cannot be overemphasized.

2-39. MOUNTING OF EQUIPMENT.

2-40. RADIO RECEIVER-TRANSMITTER RT-128A/ARC-21. Unscrew the large knurled nuts at either side of the mounting and slide the washers against the nuts. Place the radio receiver-transmitter on the mounting so that it can slide back into place a distance of about three inches. Slide it back so that the pointed guides engage the rear brackets and the hooks at the front engage beneath the front edge of Mounting MT-971/U. Raise the two large knurled nuts in front, and screw them tight. Be sure they engage the front brackets on the mounting. Connect the various cables going to the unit. (See figure 6-9.)

2-41. POWER SUPPLY. The same instructions apply for either type of aircraft power supply. Slide the back end of the power supply in the mounting as far as it will go; this will engage the pointed guides with the rear brackets. Turn the large knurled thumb screws on the front of the power supply counterclockwise until the pointed guides are flush with the front of the power supply. Now turn the large knurled thumb screws clockwise until they are tight. The pointed guides should engage holes in the front of the mounting. Connect up the cables going to the unit. (See figure 6-9.)

2-42. RADIO SET CONTROL C-451/ARC-21. Pull the cables through the mounting rack and connect them to Radio Set Control C-451A/ARC-21. (See figure 6-9.) Hold the control in place and turn the slotted fasteners clockwise until they engage.

2-43. INSTALLATION CHECK.

2-44. On completion of installation use frequencies given in table VII and check operation as given in paragraph 2-24 to 2-30. When the Emergency Keyer AN/ARA-26 is used, check system for correct transmitter frequency and coding of transmitted signals with Emergency Keyer AN/ARA-26 operating.

2-45. PREPARATION FOR RESHIPMENT.

2-46. No preparation other than removal and packing is necessary to make the equipment ready for reshipment. The equipment is shipped with tubes in place; the units are placed in separate containers so that individual items can be shipped separately.

2-47. DISASSEMBLY FOR SHIPMENT OR STORAGE. No special disassembly is required for shipment or storage.

2-48. REMOVAL FROM MOUNTINGS. To remove a unit from its mounting, first disconnect it from all external cables and leads. For the radio receiver-transmitter unscrew the large knurled nuts on either side of the mounting until free and slide the unit forward about three inches. The unit may be lifted out of the mounting.

2-49. The power supply is removed by turning the two knurled thumb screws in front counterclockwise until the pointed guides are clear of the mounting holes. Lift the front by the same screws and pull forward about three inches. Lift the power supply out of the mounting.

2-50. Remove the radio set control by turning the six slotted screws, on the panel sides, one-quarter turn counterclockwise. The control should now be free of the rack. Pull the control outward and disconnect the cables.

2-51. SECURING WITHIN CRATE. The packing material in the original crate provides all the material necessary to secure the unit being shipped in the crate. This material may be corrugated cardboard fillers, specially cut pieces of wood, or soft batting.

2-52. SPECIAL CRADLES. All special cradles used as original packing should be kept and used for reshipment. The cradles and pallets used are constructed to be used a number of times without damage.

2-53. REMOVAL OF TUBES. The equipment is shipped with tubes in place. No tubes must be removed for shipping purposes.

SECTION III

TEST EQUIPMENT AND TOOLS

3-1. TEST EQUIPMENT REQUIRED.

3-2. This section lists all test equipment and tools required for the disassembly, assembly, and testing of Radio Set AN/ARC-21. Common types of tools, such as screwdrivers, pliers, sidecutters and soldering irons are not listed but will be used at the discretion of the maintenance personnel.

3-3. Table IX lists test equipment required.

3-4. SPECIAL TOOLS REQUIRED.

3-5. Several special tools are required for the maintenance of the AN/ARC-21 equipment. The Bristo wrenches and nylon screwdriver listed in table X, are supplied mounted in clips fastened to the Chassis, Receiver-Transmitter MX-1424A/ARC-21. A duplicate screwdriver and set of wrenches are contained in Test Kit, Radio MK-136/ARC-21 as are also a number of test cables for connecting the chassis to the re-

TABLE IX. TEST EQUIPMENT REQUIRED

Figure No.	Name	AN Type Designation	Alternate Designation	Application
3-2	R-F Monitoring Probe and Extension Rod	ID-263/U O-904	------	Measuring transmitter output voltage.
3-6	Frequency Meter	FR-47/U	------	Check transmitter and receiver frequencies.
3-7	Oscilloscope	OS-8/U	------	Comparing frequencies and wave forms visually.
3-8	Multimeter	TS-352/U	------	Voltage, current, and resistance checks.
3-9	Voltmeter	TS-375/U	------	Measuring voltages in high impedance circuits.
3-10	Audio Oscillator	TS-382/U	------	Supply audio signals for audio and modulator tests.
3-5	Interconnecting Box	J-520/U	------	Power connections for power supply.
3-11	Signal Generator	TS-413/U	------	Supply r-f signals for receiver tests.
3-12	Dummy Load, Electrical	DA-72/U	------	Transmitter power output measurements.
3-13	Tube Tester	*TV-7/U	------	Checking condition of tubes.
3-1	Multimeter	ME-75/ ARC-21	------	Measures voltages and currents.
3-15	Test Cradle	MT-1164/U	------	Supporting Radio Receiver-Transmitter RT-128A/ARC-21 during test.
3-16	Test Kit, Radio	MK-136/ ARC-21	------	Extension cables and special tools.
3-20 3-21	**Bench Test Cable	------	------	Interconnection between units and power source.
3-17	Output Meter	TS-585/U	------	Measuring audio output power.
3-3	Dummy Load, Electrical	DA-84/ ARM-6	------	Quick visual indication of transmitter power output.
3-4	Interference Generator	SG-23/U	------	Quick test of receiver sensitivity.
3-18	Dynamotor Test Set	TS-414/U	------	Dynamotor checks.
3-14	Multimeter	TS-297/U	------	General usage.

* Or I-177 Tube Tester and MX-949/U Tube socket adapter. (See figure 3-19.)
** See paragraphs 3-9 to 3-37 for cable fabrication.

TABLE X. TOOLS REQUIRED

Figure No.	Part Number	Name	Application
3-16, 8-2	------	Bristo No. 4 Wrench	For loosening and tightening Bristo No. 4 setscrews.
3-16, 8-2	------	Bristo No. 6 Wrench	For loosening and tightening Bristo No. 6 setscrews.
3-16, 8-2	------	Nylon Screwdriver	To adjust cores of coils during alignment.
3-16	------	Test Cables (See par. 2-10 for details on types.)	Connecting chassis to their respective jacks when removed for servicing.

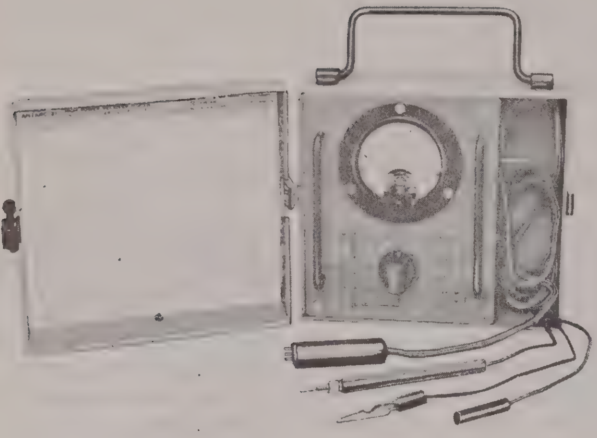


Figure 3-1. Multimeter ME-75/ARC-21

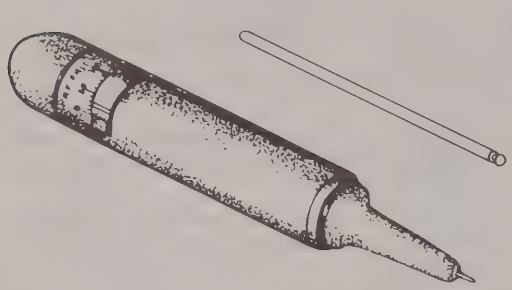


Figure 3-2. R-F Monitoring Probe ID-263/U and Extension Rod O-904

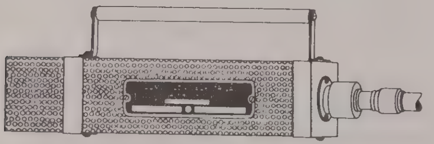


Figure 3-3. Dummy Load, Electrical DA-84/ARM-6

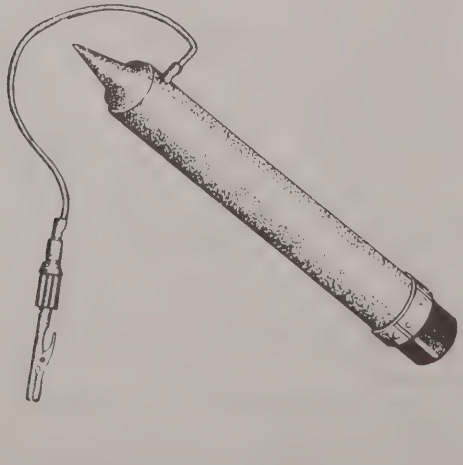


Figure 3-4. Interference Generator SG-23/U

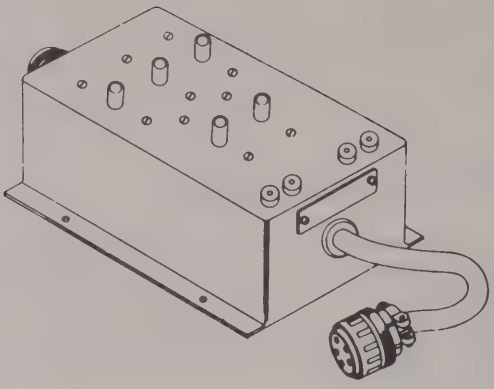


Figure 3-5. Interconnecting Box J-520/U

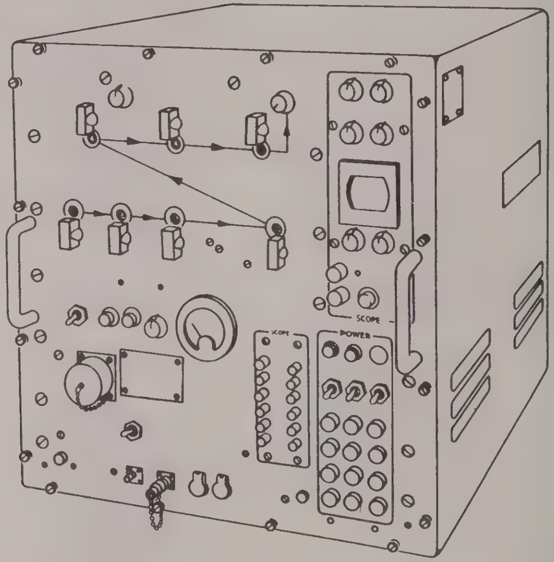


Figure 3-6. Frequency Meter FR-47/U

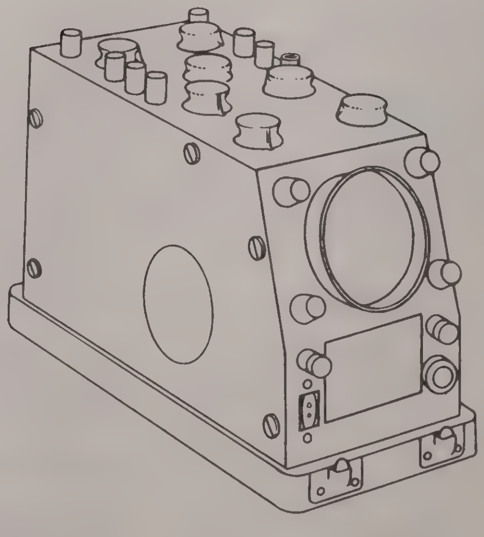


Figure 3-7. Oscilloscope OS-8/U

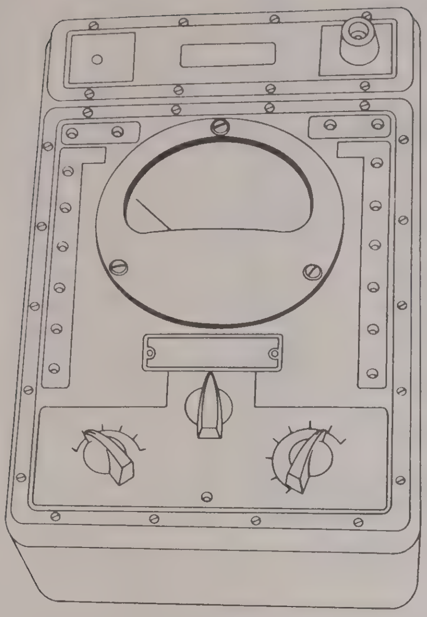


Figure 3-8. Multimeter TS-352/U

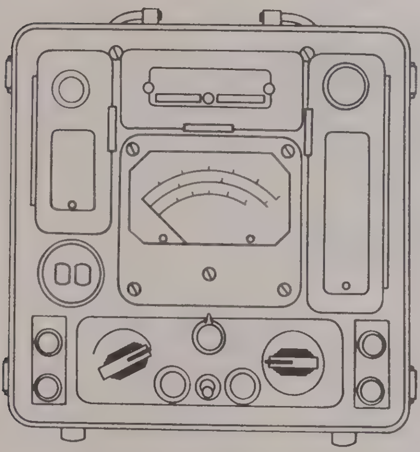


Figure 3-9. Voltmeter TS-375/U

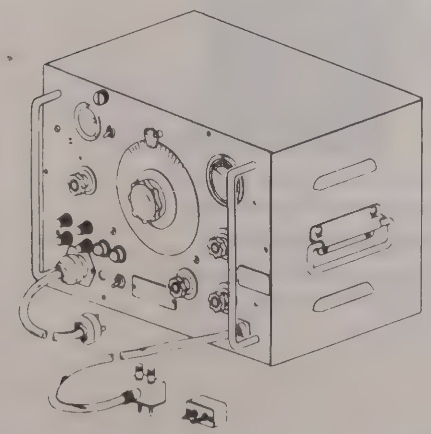


Figure 3-10. Audio Oscillator TS-382/U

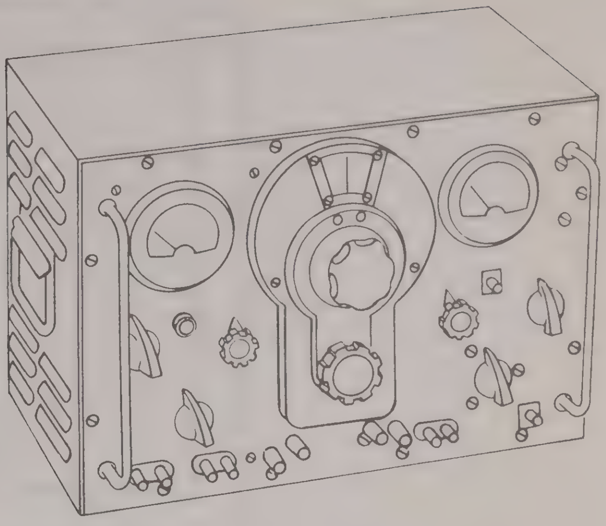


Figure 3-11. Signal Generator TS-413/U

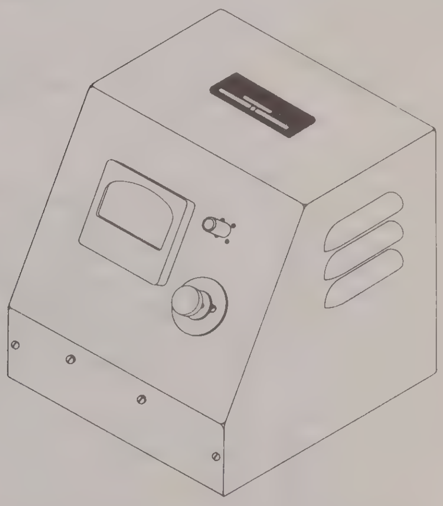


Figure 3-12. Dummy Load, Electrical DA-72/U

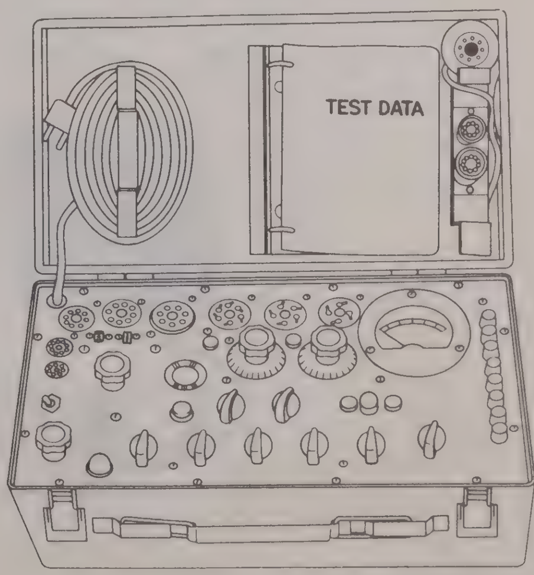


Figure 3-13. Tube Tester TV-7/U

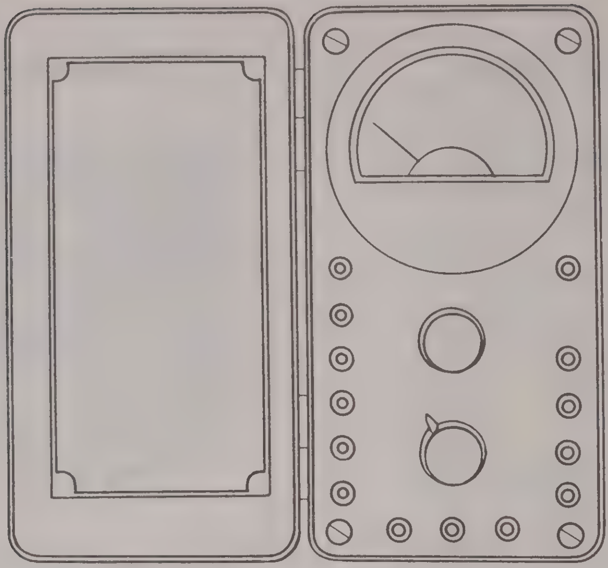


Figure 3-14. Multimeter TS-297/U

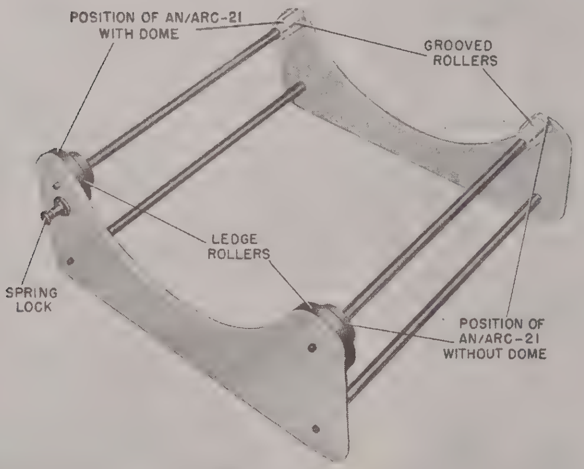

POSITION OF AN/ARC-21
WITH DOME
GROOVED
ROLLERS
LEDGE
ROLLERS
SPRING
LOCK
POSITION OF
AN/ARC-21
WITHOUT DOME

Figure 3-15. Test Cradle MT-1164/U

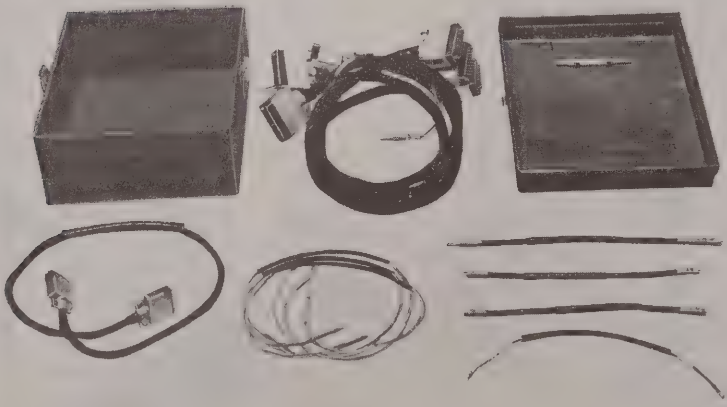


Figure 3-16. Test Kit, Radio MK-136/ARC-21

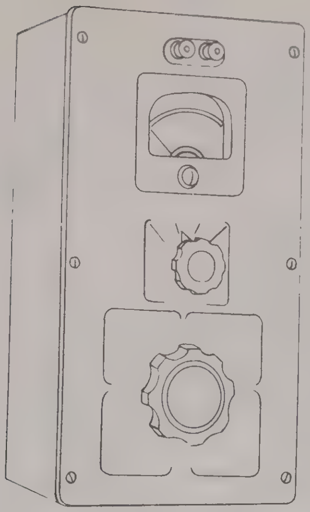


Figure 3-17. Output Meter TS-585/U

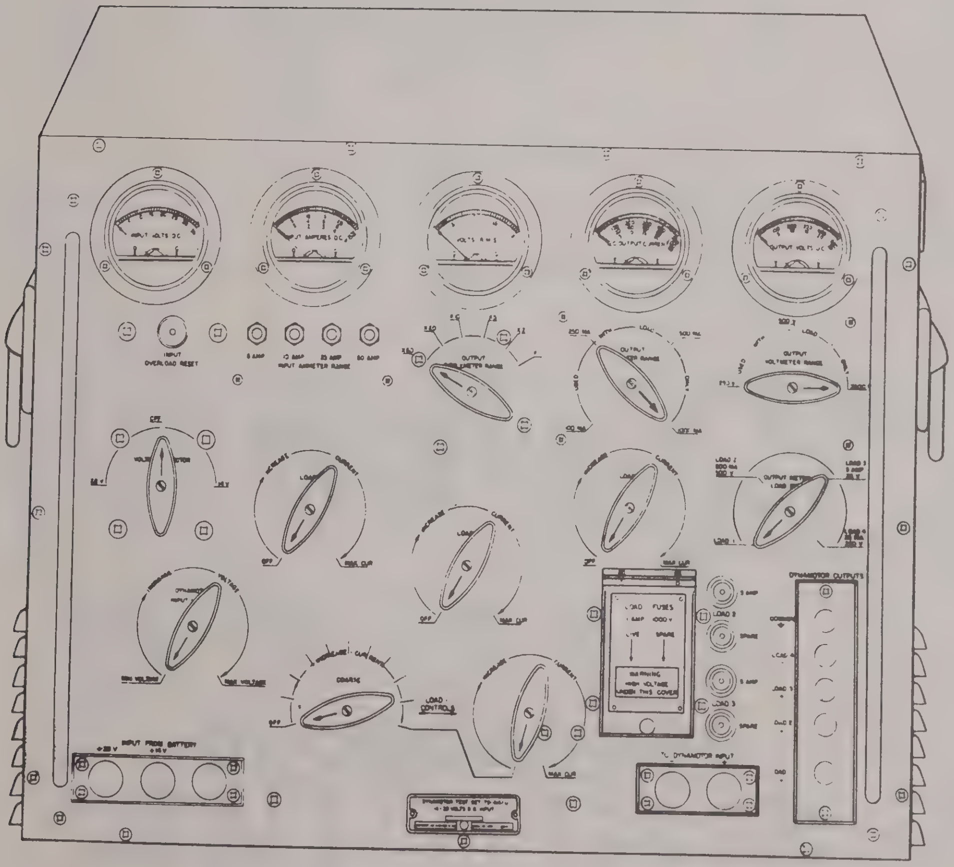
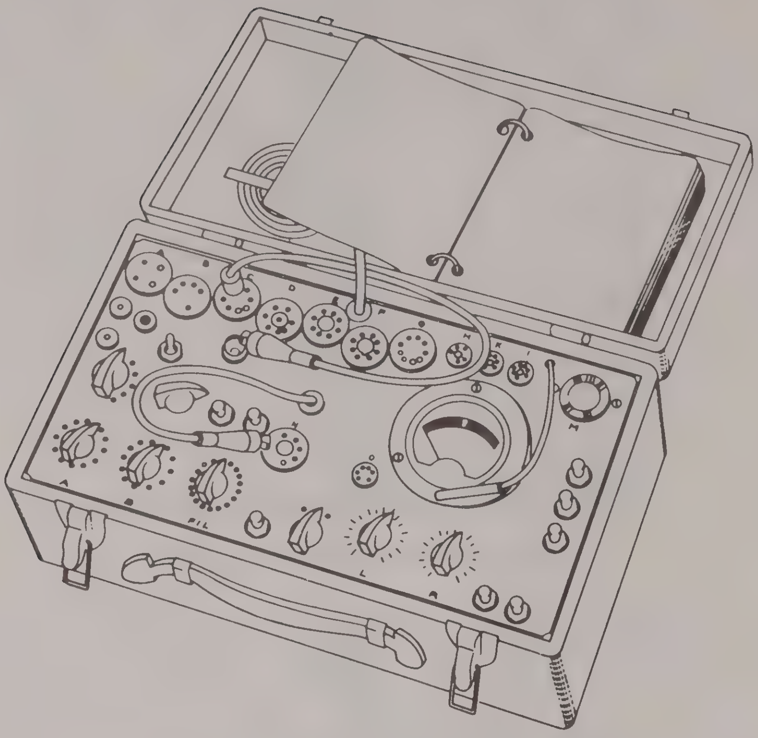
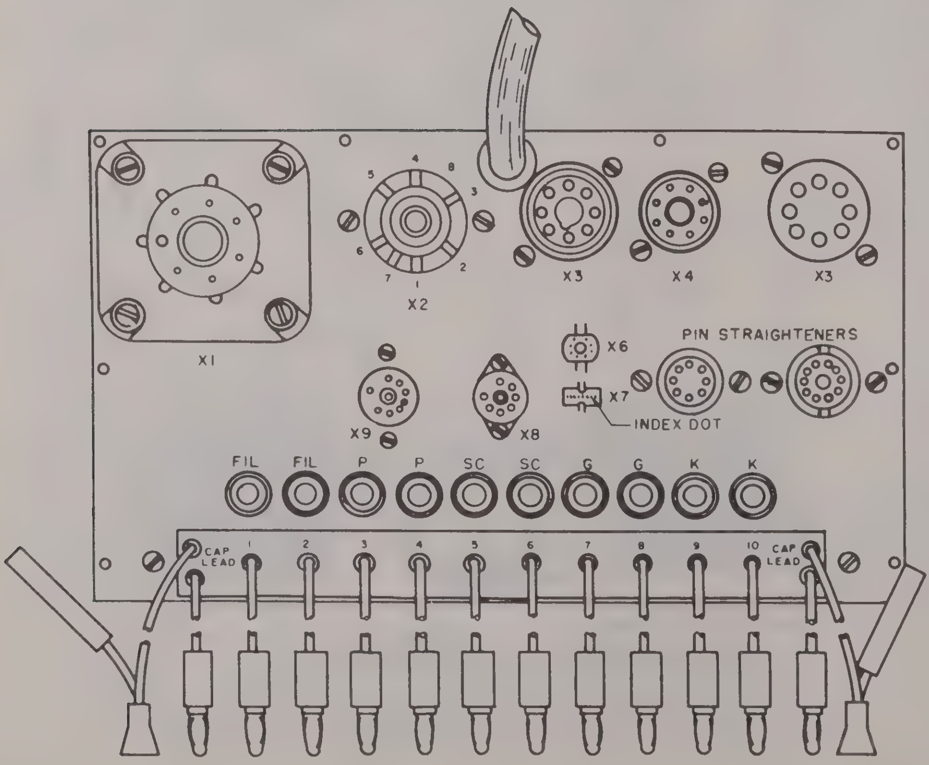

INPUT VOLTS DC
VOLTS R M S
OUTPUT VOLTS DC
INPUT
OVERLOAD RESET
INPUT AMMETER RANGE
OUTPUT
OUTPUT
VOLTMETER RANGE
OFF
LOAD
CURRENT
OFF
MAX CUR
LOAD 1
LOAD 2
LOAD 3
LOAD 4
DYNAMOTOR OUTPUTS
LOAD FUSES
1 AMP 1000 V
LIVE SPARE
WARNING
HIGH VOLTAGE
UNDER THIS COVER
5 AMP
SPARE
MIN VOLTAGE
MAX VOLTAGE
COARSE
OFF
LOAD
CONTROLS
INPUT FROM BATTERY
+28 V
+14 V
TO DYNAMOTOR INPUT

Figure 3-18. Dynamotor Test Set TS-414/U



Tube Tester I-177


X1
1
2
3
4
5
6
7
8
X2
X3
X4
X3
X6
X7
INDEX DOT
PIN STRAIGHTENERS
X9
X8
FIL
FIL
P
P
SC
SC
G
G
K
K
CAP LEAD
1
2
3
4
5
6
7
8
9
10
CAP LEAD

Tube Socket Adapter Kit MX-949/U

Figure 3-19. Tube Tester I-177 and Tube Socket Adapter Kit MX-949/U

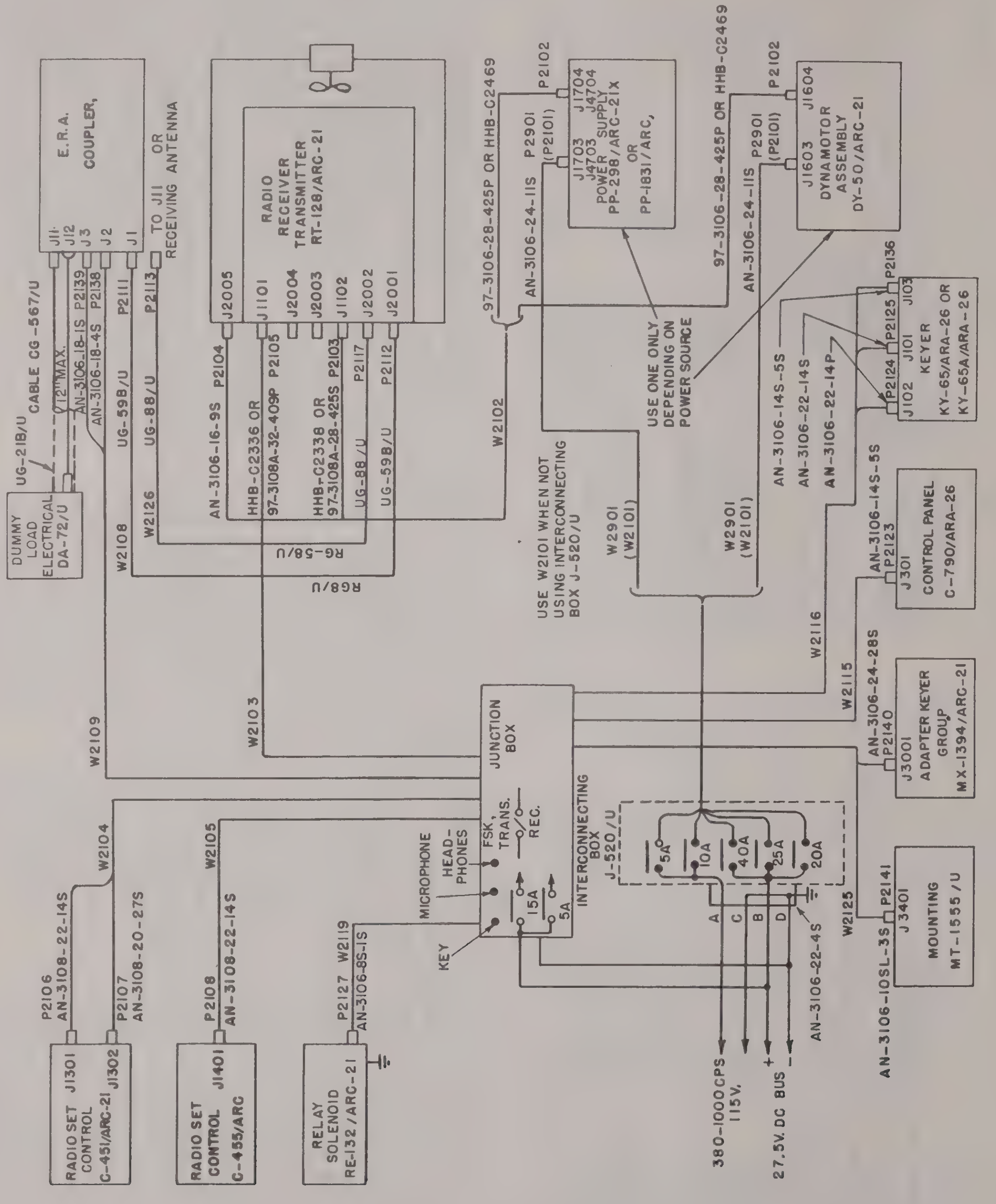

RADIO SET CONTROL C-451/ARC-21
J1301
J1302
P2106
AN-3108-22-14S
P2107
AN-3108-20-27S
W2104
RADIO SET CONTROL C-455/ARC
J1401
P2108
AN-3108-22-14S
W2105
RELAY SOLENOID RE-132/ARC-21
P2127 W2119
AN-3106-8S-1S
KEY
MICROPHONE
HEAD-PHONES
FSK, TRANS.
REC.
15A
5A
INTERCONNECTING BOX J-520/U
5A
10A
40A
25A
20A
A
C
B
D
AN-3106-22-4S
380-1000CPS 115V.
27.5V. DC BUS + -
AN-3106-10SL-3S
W2125
P2141
J3401
MOUNTING MT-1555/U
JUNCTION BOX
W2109
W2103
AN-3106-24-28S
P2140
J3001
ADAPTER KEYER GROUP MX-1394/ARC-21
W2115
W2116
AN-3106-14S-5S
P2123
J301
CONTROL PANEL C-790/ARA-26
USE W2101 WHEN NOT USING INTERCONNECTING BOX J-520/U
W2901 (W2101)
W2901 (W2101)
AN-3106-14S-5S
AN-3106-22-14S
AN-3106-22-14P
P2124
J102
J101
P2125
J103
P2136
KEYER KY-65/ARA-26 OR KY-65A/ARA-26
USE ONE ONLY DEPENDING ON POWER SOURCE
AN-3106-24-11S
97-3106-28-425P OR HHB-C2469
P2901 (P2101)
J1603
J1604
P2102
DYNAMOTOR ASSEMBLY DY-50/ARC-21
AN-3106-24-11S
97-3106-28-425P OR HHB-C2469
P2901 (P2101)
P2102
J1703 J4703
J1704 J4704
POWER SUPPLY PP-298/ARC-21X OR PP-1831/ARC,
W2102
DUMMY LOAD ELECTRICAL DA-72/U
UG-21B/U
CABLE CG-567/U
12" MAX.
AN-3106-18-1S P2139
AN-3106-18-4S P2138
UG-59B/U P2111
UG-88/U P2113
W2108
W2126
RG8/U
RG-58/U
J11
J12
J3
J2
J1
E.R.A. COUPLER,
TO J11 OR RECEIVING ANTENNA
AN-3106-16-9S P2104
HHB-C2336 OR 97-3108A-32-409P P2105
HHB-C2338 OR 97-3108A-28-425S P2103
UG-88/U P2117
UG-59B/U P2112
J2005
J1101
J2004
J2003
J1102
J2002
J2001
RADIO RECEIVER TRANSMITTER RT-128/ARC-21

Figure 3-21. Bench Test Cable Fabrication Radio Set AN/ARC-21 with Adapter, Keyer Group MX-1394/ARC-21

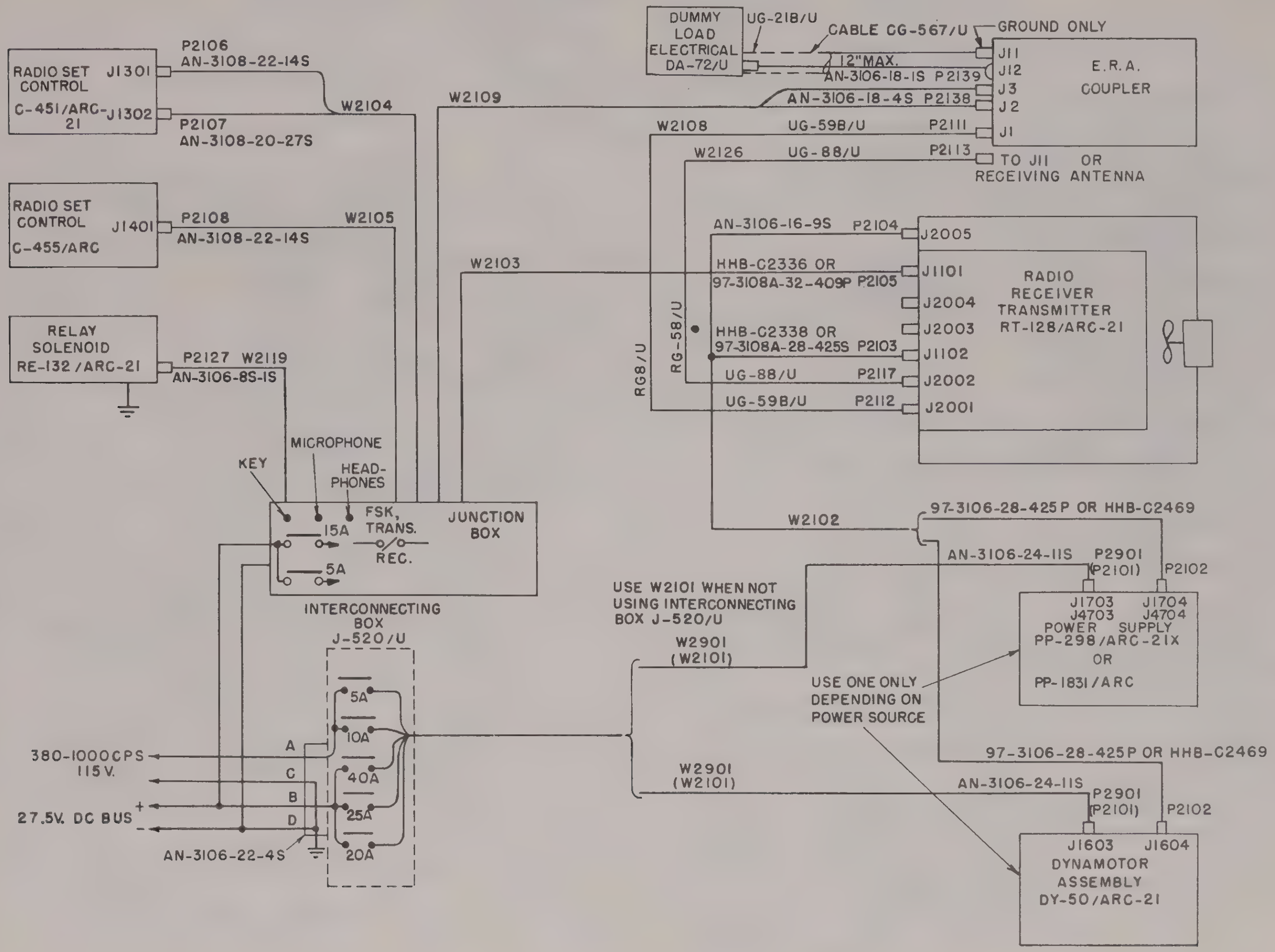

RADIO SET CONTROL C-451/ARC-21
J1301
J1302
P2106
AN-3108-22-14S
P2107
AN-3108-20-27S
W2104
RADIO SET CONTROL C-455/ARC
J1401
P2108
AN-3108-22-14S
W2105
RELAY SOLENOID RE-132/ARC-21
P2127 W2119
AN-3106-8S-1S
W2109
W2103
DUMMY LOAD ELECTRICAL DA-72/U
UG-218/U
CABLE CG-567/U
GROUND ONLY
12"MAX.
AN-3106-18-1S P2139
AN-3106-18-4S P2138
J11
J12
J3
J2
J1
E.R.A. COUPLER
W2108
UG-59B/U
P2111
W2126
UG-88/U
P2113
TO J11 OR RECEIVING ANTENNA
AN-3106-16-9S
P2104
J2005
HHB-C2336 OR
97-3108A-32-409P P2105
J1101
J2004
J2003
HHB-C2338 OR
97-3108A-28-425S P2103
J1102
UG-88/U
P2117
J2002
UG-59B/U
P2112
J2001
RG8/U
RG-58/U
RADIO RECEIVER TRANSMITTER RT-128/ARC-21
MICROPHONE
KEY
HEAD-PHONES
FSK, TRANS.
REC.
15A
5A
JUNCTION BOX
INTERCONNECTING BOX J-520/U
5A
10A
40A
25A
20A
A
C
B
D
380-1000CPS 115V.
27.5V. DC BUS
+
-
AN-3106-22-4S
W2102
97-3106-28-425P OR HHB-C2469
AN-3106-24-11S
P2901 (P2101)
P2102
J1703 J4703
J1704 J4704
POWER SUPPLY PP-298/ARC-21X
OR
PP-1831/ARC
USE W2101 WHEN NOT USING INTERCONNECTING BOX J-520/U
W2901 (W2101)
USE ONE ONLY DEPENDING ON POWER SOURCE
W2901 (W2101)
97-3106-28-425P OR HHB-C2469
AN-3106-24-11S
P2901 (P2101)
P2102
J1603 J1604
DYNAMOTOR ASSEMBLY DY-50/ARC-21

Figure 3-20. Bench Test Cable Fabrication Radio Set AN/ARC-21

ceiver-transmitter when the chassis is operated externally. This test kit is packed in Case, Test Kit CY-1408/ARC-21. Included in the cables are: Cable Assembly, Special Purpose, Electrical CX-2157/U; Cable Assembly, Special Purpose, Electrical CX-2158/U; Lead, Electrical CX-2376/ARC-21; Cable Assembly, Radio Frequency CG-1077/ARC-21; Cable Assembly, Radio Frequency CG-1109/ARC-21.

3-6. CABLE FABRICATION.

3-7. A test bench cable should be fabricated for the particular system being serviced. Two bench test cable fabrication procedures and diagrams are given, one for the Radio Set AN/ARC-21 and one for Radio Set AN/ARC-21 including Keyer Adapter Group MX-1394/ARC-21 and Emergency Keyer AN/ARA-26. The cable length and the positioning of the various units on the bench are not critical. Place the various units in convenient working positions and make up the cable, allowing sufficient extra wire at the various plugs to permit redressing of the wires in case any should become broken in service. After laying the various wires in place, lace them to provide a cable. This will protect the individual wires during use.

3-8. The following paragraphs give the plug types, wire size and type, and other items to make up the test cables.

3-9. BENCH TEST CABLE FABRICATION, RADIO SET AN/ARC-21. (See figure 3-20.)

3-10. ADDITIONAL MATERIALS REQUIRED

3-11. CIRCUIT BREAKERS. Two circuit breakers for the junction box are required as follows:

1-MS25005-15 rated at 15 amperes

1-MS25005-5 rated at 5 amperes

Additional circuit breakers with a suitable box for wiring and mounting are required if Interconnecting Box J-520/U is not used. These are listed in paragraphs 3-12, 3-13. Table XII describes cable W2101 used in place of Interconnecting Box J-520/U.

3-12. When using the Dynamotor Assembly DY-50/ARC-21, the following circuit breakers are necessary:

1-MS25005-20 rated at 20 amperes

1-MS25005-25 rated at 25 amperes

1-MS25005-40 rated at 40 amperes

3-13. When using Power Supply PP-298/ARC-21X or Power Supply PP-1831/ARC the following circuit breakers are necessary:

1-MS25005-25 rated at 25 amperes

1-MS25005-20 rated at 20 amperes

1-MS25005-10 rated at 10 amperes

1-MS25005-5 rated at 5 amperes

3-14. JUNCTION BOX. A junction box with 50 double-terminal points is required for cable interconnections. Use a metal box with sufficient clear space around the terminals for the connecting leads. The length of the individual cables will depend on the location of the junction box with reference to the equipment units. To locate the junction box, first place the individual equipment units in positions convenient for access during servicing. The junction box should now be placed where it is accessible and permit minimum length of cables to the units. Knockouts or holes for the cables must be provided for the cables to enter the junction box as shown in figure 3-20. The key, microphone and headphone jacks, the fsk send-receive switch and a 20-ampere circuit breaker are mounted in the junction box.

3-15. CABLES.

3-16. Fabricate the cables by measuring the individual leads as they are checked off on the particular chart for the cable. Allow an excess of two to three inches to allow for future repairs, should some leads break in the meantime. Detailed instructions are given in paragraphs 3-17 through 3-22 and table XII through XVII. Table XI lists the necessary fittings.

3-17. Wire sizes given on the tables are suitable for a cable length up to 150 feet and should be used on the bench cables for mechanical strength, even though they will be less than 15 feet long. Before soldering wires to the plugs, slide the fitting over the cable in the proper order for assembling. After the leads are soldered to the plug terminals assemble plug and fittings and lace or tie the individual wires, together to make a cable. Protect the cables, where they enter the junction box, with a bushing in the junction box hole or tape on the cable.

3-18. Cables W2102 and W2104 have 2 plugs to the unit in question. Make the breakout for these plugs at a point 8 to 12 inches from the plugs. Cables W2108 and W2126 are fabricated from coaxial cable and should be run direct to the jacks indicated. Table XI lists the fittings required to make up the required cables.

3-19. CABLE FROM POWER SOURCE TO INTERCONNECTING BOX J-520/U. (See figure 3-20.) Six leads are required for this cable including the two leads for the 27.5-volt connections between the cable and junction box. Wire size must be such as to supply rated line voltage, under full load conditions, as measured at the tip jacks of the Interconnecting Box J-520/U. Maximum d-c load will be approximately 60 amperes and maximum a-c load will be 15 amperes. Fabrication of the power source end of this cable will depend on the type of terminals used on the power source. A type AN3106-22-4S connector and AN3057-12A adaptor is required for the Interconnecting Box J-520/U end of the cable. Connect the 27.5-volt positive lead to pin B of the plug and the 27.5-volt negative lead to pin D and ground. Connect the 115-volt a-c lead from the high side of the power source to pins C and D. Splice the two remaining leads to the 27.5-volt supply leads and terminate the positive lead at the junction box circuit breaker. Terminate the negative lead at the junction box ground.

TABLE XI. FITTINGS REQUIRED FOR CABLE FABRICATION, RADIO SET AN/ARC-21

Quantity	Plug Type	Adapter	Symbol
2	AN3108-22-14S	AN3057-12A	P2106-P2108
1	AN3108-20-27S	AN3057-12A	P2107
1	AN3106E-8S-1S	AN3057-3A	P2127
2	UG-59B/U		P2111-P2112
1	AN3106-16-9S	AN3057-8A	P2104
1	973108-32-409-P or HHB-2336	AN3057-20A or HHB-2604 and AN3057-12A	P2105
1	97-3108-28-426S HHB-2338	AN3057-16A or HHB-2603	P2103
1	AN3106-24-11S	AN3057-16A	P2101
1	AN3106-18-4S	AN3057-10A	P2138
1	AN3106-18-4S	AN3057-10A	P2139

TABLE XII. CABLE W2101 POWER SUPPLY TO MAIN BUS

Plug Designation	Circuit Description	Circuit Breaker Capacity
	Note This cable need only be fabricated if Interconnecting Box J-520 is not used. Run cable direct from breaker box to power supply. Run leads from plug to plug through junction box without terminating therein.	
	DY-50/ARC-21	
P2101A	Not Used	-
P2101B	Not Used	-
P2101C	Not Used	-
P2101D	Ratchet and Relay Supply	20 amp
P2101E	Blower Motor and Low Voltage Dynamotor Supply	25 amp
P2101F	High Voltage Dynamotor and 4-65A Heater Supply	40 amp
P2101G	Not Used	-
P2101H	Ground	-
P2101I	Ground	-
	PP-298/ARC-21X AND PP-1831/ARC	
P2101A	A-C Supply to Filament and Low Voltage Transformer	5 amp
P2101B	A-C Supply to High Voltage Transformer	10 amp
P2101C	A-C Common (ground)	-
P2101D	Ratchet and Relay Supply	20 amp
P2101E	Blower Motor and Heater Supply	15 amp
P2101F	Not Used	-
P2101G	Not Used	-
P2101H	Ground	-
P2101I	Ground	-

Lead size must be such as to supply normal of 27.5 volts dc and 415 volts ac to pins of P2101 under full load. Two leads are required to connect 27.5 volts dc to the circuit breakers and ground in the junction box.

TABLE XIII. CABLE W2102 POWER SUPPLY TO RECEIVER-TRANSMITTER RT-428A/ARC-21

Plug Designation	Circuit Description	Voltage to Ground	30 Ft. B&S No.	To Receiver Transmitter
P2102A	+140 Supply	140	22	P2103A
P2102B	+400 Supply	400	22	P2103B
P2102C	Spare			
P2102D	Master ON-OFF	27.5	22	P2104C
P2102E	Mike Tip	27.5	22	P2103E
P2102F	High Voltage Control	27.5	22	P2103F
P2102H	+1000 Supply	1000	22	P2103H
P2102J	Bias Short	27.5	22	P2103J
P2102K	4-65A Filaments	27.5	14	P2103K
P2102L	Heaters (ac or dc)	27.5	14	P2103L
P2102M	-40 Power Amplifier Bias	40	22	P2103M
P2102N	-18 Modulator Bias	18	22	P2103N
P2102P	-20 Receiver Bias	20	22	P2103P
P2102R	Spare			
P2102S	Heaters, dc	27.5	18	P2103S
P2102T	Blower Supply	27.5	14	P2104A
P2102U	Ratchet Supply	27.5	14	P2103U
P2102V	Relay Supply	27.5	14	P2103V
P2102W	Motors	27.5	14	P2103W
	Ground		12	P2103T
Below leads separate from W2102 cable 18 inches from P2103 and connect to P2104, AN-3106-16-9S and are not routed through the junction box.				
P2104A	Blower Supply	27.5	14	P2102T
P2104B	Spare			P2102D
P2104C	Master On-Off (Interlock)	27.5	14	P2102D
P2104D				

Note: B&S No. 14 leads in above cable may be reduced to B&S No. 16 for cable length of less than 18 feet.

TABLE XIV. CABLE W2103, RECEIVER-TRANSMITTER RT-128A/ARC-21 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2105A	Controlled 27.5 Volts	27.5	16	3	P2106C
P2105B	Controlled 27.5 Volts Paralleled	27.5	16	3	P2106D
P2105C	Controlled 27.5 Volts	27.5	16	3	P2106E
P2105D	††Bridge Supply (in)	27.5	16	4	P2140A
P2105E	Bridge, Units (in)	27.5	16	5	P2140F
P2105F	Bridge, Tens (in)	27.5	18	6	P2140G
P2105H	Bridge, Hundreds (in)	27.5	18	7	P2140H
P2105J	Bridge, Thousands (in)	27.5	16	8	P2140P
P2105K	Master On-Off	27.5	22	9	P2107E
P2105L	Take Control Trip Paralleled	27.5	16	10	P2107B
P2105M	Take Control Trip	27.5	16	10	P2107C
P2105N	Take Control Switching (in)	27.5	22	11	P2125L
P2105P	*Homing Lockout	27.5	16	44	P2110H
P2105R	Receiver Sensitivity	-	22	13	P2106F
P2105S	CW Tone Adjust	-	22	14	P2107A
P2105T	**Audio Output	-	22	15	P2107F
P2105U	CW Broad-Sharp Selector	27.5	22	16	P2106K
P2105V	CW/FSK-Voice Selector	27.5	22	17	P2125R
P2105W	Voice-FSK Selector	27.5	22	31	P2126B
P2105X	Hi-Lo Power Switch	27.5	22	19	P2125C
P2105Y	Spare	-	-	-	-

TABLE XIV. CABLE W2103, RECEIVER-TRANSMITTER RT-128A/ARC-21 TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2105Z	Start Cycle Switching (in)	27.5	22	21	P2125J
P2105AA	††Bridge Supply (in)	27.5	16	4	P2140J
P2105BB	Spare	-	-	-	-
P2105CC	Spare	-	-	-	-
P2105a	**Key	27.5	16	27	P2125B
P2105b	**Mike	-	22	28	-
P2105c	**Audio Common	-	22	29	-
P2105d	Mike Tip (Transmitter Control)	27.5	16	30	P3136C
P2105f	Modulator Lock Out	27.5	22	32	P2140M
P2105g	Keying Relay	27.5	18	33	P2110P
P2105h	Coder Control	27.5	22	34	P2110A
P2105i	Coder Control	27.5	22	35	P2110B
P2105j	Coder Control	27.5	22	36	P2110E
P2105k	Coder Control	27.5	22	37	P2110F
P2105m	Coder Control	27.5	22	38	P2110G
P2105n	Cable Load Relay, Hold	27.5	22	39	P2110F
P2105p	Cable Load Relay, Control	27.5	22	40	P2110G
P2105q	Capacitor Brake Control	27.5	16	41	P2110N
P2105r	Capacitor Motor Control	27.5	18	42	P2110W
P2105s	†Driver Cut-Off	20.0	22	43	P2110U
P2105t	Spare	-	-	-	-
P2105u	Transmit Finish Cycle	27.5	22	45	-
P2105v	+140 V d-c Supply	140	22	46	P2115N
P2105w	Homing Lock Out	27.5	22	44	P2110H
P2105x	Spare	-	-	-	-
P2105y	Spare	-	-	-	-
P2105z	Spare	-	-	-	-

* For Coupler, Antenna CU-145/ARC-21. When using E.R.A. Type 3001A-2 or 3001B-2 coupler, remove lead P2105P from terminal 44 in junction box.

** Shielded.

† Ground terminal 43 when antenna coupler is not used.

†† P2105D and P2105AA paralleled.

TABLE XV. CABLE W2104. RADIO SET CONTROL C-451A/ARC-21 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2106A	Ground	-	16	-	-
P2106B	Lamp Supply	27.5	22	1	-
P2106C	Controlled 27.5 volts	27.5	16	3	P2105A
P2106D	Controlled 27.5 volts Paralleled	27.5	16	3	P2105B
P2106E	Controlled 27.5 volts	27.5	16	3	P2105C
P2106F	Receiver Sensitivity	-	22	13	P2105R
P2106G	Volume Control	-	22	12	Interphone
P2106H	Voice/FSK Selector	27.5	16	31	P2126A
P2106J	Spare	-	-	-	-
P2106K	CW Broad-Sharp Selector	27.5	22	16	P2105U
P2106L	Channel Selector L	27.5	22	22	P2108L
P2106M	Channel Selector M	27.5	22	23	P2108M
P2106N	Channel Selector N	27.5	22	24	P2108N
P2106P	Channel Selector P	27.5	22	25	P2108P
P2106R	Channel Selector R	27.5	22	26	P2108R
P2106S	Hi-Lo Power Switching	27.5	22	19	P2105X
P2106T	Start Cycle Switching	27.5	22	21	P2105Z
P2106U	Spare	-	-	-	-
P2106V	Spare	-	-	-	-
P2107A	CW Tone Adjust	-	22	14	P2105S
P2107B	Take Control Trip Paralleled	27.5	16	10	P2105L

TABLE XV. CABLE W2104. RADIO SET CONTROL C-451A/ARC-21 TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2107C	Take Control Trip Paralleled	27.5	16	10	P2105M
P2107D	Take Control Switching	27.5	22	11	P2105N
P2107E	Master On-Off	27.5	22	9	P2105K
P2107F	*Audio Output	-	22	15	P2105T
P2107G	CW/FSK-Voice Selector	27.5	22	17	P2105V
P2107H	†Bridge Supply	27.5	16	4	P2105D
P2107I	Bridge, Thousands	27.5	16	8	P2105J
P2107J	Bridge, Hundreds	27.5	18	7	P2105H
P2107K	Bridge, Tens	27.5	18	6	P2105F
P2107L	Bridge, Units	27.5	16	5	P2105E
P2107M	†Bridge ,Supply	27.5	16	4	P2105AA
P2107N	Ground	-	16	-	-

*Shielded.
†P2107H and P2107M paralleled.

TABLE XVI. CABLE W2105. RADIO SET CONTROL C-455/ARC TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2108A	Ground	0	16	-	-
P2108B	Lamp Supply	27.5	22	1	-
P2108C	Hi-Lo Power Switching	27.5	22	19	P2105X
P2108D	Receiver Sensitivity	-	22	13	P2105R
P2108E	Volume Control	-	22	12	P2106G
P2108F	Take Control Trip] Paralleled	27.5	16	10	P2105L
P2108G	Take Control Trip]	-	16	10	P2105M
P2108H	Take Control Switching	27.5	22	11	P2105N
P2108J	Master On-Off	27.5	22	9	P2105K
P2108K	*Audio Output	-	22	15	P2105T
P2108L	Channel Selector L	27.5	22	22	P2106L
P2108M	Channel Selector M	27.5	22	23	P2106M
P2108N	Channel Selector N	27.5	22	24	P2106N
P2108P	Channel Selector P	27.5	22	25	P2106P
P2108R	Channel Selector R	27.5	22	26	P2106R
P2108S	Spare	-	-	-	-
P2108T	Spare	-	-	-	-
P2108U	Spare	-	-	-	-
P2108V	Spare	-	-	-	-

*Shielded.

TABLE XVII. CABLE W2109. E.R.A. TYPE 3001A-2 AND 3001B-2 ANTENNA COUPLER TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2138A	115-Volt a-c Supply	115	14	65	*
P2138B	27.5 Volts	27.5	22	2	**
P2138C	Ground	0	12	-	-
P2138D	Spare	-	-	-	-
P2139A	Driver Cut-Off	20	22	68	P2105s
P2139B	Hi-Lo Power Switch	27.5	22	19	P2105X

TABLE XVII. CABLE W2109. E.R.A. TYPE 300-A-2 AND 300-B-2 ANTENNA COUPLER TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2139C	Ground	0	12		
P2139D	Keying Relay	27.5	22	33	P2105g
P2139E	Master On-Off	27.5	14	9	P2105K
P2139F	Cable Load Relay, Hold	27.5	22	39	P2105n
P2139G	Cable Load Relay, Control	27.5	22	40	P2105p
P2139H	Homing Lockout	27.5	22	44	P2105w
P2139					
P2139J	Antenna Shorting Relay	27.5	14	49	P2127

*Connect through 5-ampere circuit breaker in junction box.
**Connect through 15-ampere circuit breaker in junction box.

3-20. CABLE W2108. Use UG-59B/U plugs at both ends of RG-8/U cable. This cable connects the jack 801, on the ERA Coupler, and jack J2001 on the Receiver-Transmitter RT-128A/ARC-21. Run the cable direct.

3-21. CABLE W2119. Use plug AN 3106M-8S-1S and Adaptor AN 3057-3A for plug P2127 and a B and S number 16 wire to connect to terminal number 49 in the junction box. Plug P2127 connects the Relay, Solenoid RE-132/ARC to its energizing source. A ground lead to the relay frame is needed to complete the circuit.

3-22. CABLE W2126. Use a UG-88B/U plug on each end of RG-58/U cable. Run the cable direct from the receiving antenna to jack J2002 on the Receiver-Transmitter RT-128A/ARC-21. The plug at the coupler end is P2113 and the plug at the receiver-transmitter end is P2117.

3-23. BENCH TEST CABLE FABRICATION, RADIO SET AN/ARC-21 WITH ADAPTER KEYER GROUP MX-1394/ARC-21. (See figure 3-21.)

3-24. ADDITIONAL MATERIALS REQUIRED.

3-25. CIRCUIT BREAKERS. Three circuit breakers are required for the junction box as follows:

1-MS25005-15 rated at 15 amperes

1-MS25005-5 rated at 5 amperes

Additional circuit breakers are required, if Interconnecting Box J-520/U is not used, together with a suitable metal box for wiring and mounting. The additional circuit breakers required are listed in paragraphs 2-37 and 2-38.

3-26. When using the Dynamotor Assembly DU-50 ARC-21, the following circuit breakers are necessary:

1-MS25005-20 rated at 20 amperes

1-MS25005-25 rated at 25 amperes

1-MS25005-40 rated at 40 amperes

3-27. When using the Power Supply PP-298/ARC-21 or Power Supply PP-1831/ARC the following circuit breakers are necessary:

1-MS25005-20 rated at 20 amperes

1-MS25005-25 rated at 25 amperes

1-MS25005-10 rated at 10 amperes

1-MS25005-5 rated at 5 amperes

3-28. Junction Box. A junction box with 70 double-terminal points is required for cable interconnections. Use a metal box with sufficient clear space around the terminals for the connecting leads. The length of the individual cables will depend on the location of the junction box with reference to the equipment units. To locate the junction box, first place the individual equipment units in positions convenient for access during servicing. Then place the junction box where it is accessible and yet permits minimum length of cables to the units. Knockouts or holes for the cables must be provided for the cables to enter the junction box.

3-29. CABLES.

3-30. Wire sizes given in the tables are suitable for a cable length up to 150 feet and should be used on bench cables for mechanical strength even though they will be less than 15 feet long. Before soldering wires to the plugs, slide the fitting over the cable in the proper order for assembling. After the leads are soldered to the plug terminals, assemble plug and fittings, and lace to tie the individual wires together to make a cable. Protect the cables, where they enter the junction box, with a bushing in the junction box hole or tape on the cable.

3-31. Fabrication instructions are given in paragraphs 3-32 through 3-38 and tables XIX through XXVII. Table XVIII lists the necessary fittings.

3-32. Cables W2102, W2104, W2107, and W2125 have two plugs to connect to the particular unit. Make the breakout for these plugs at a point 8 to 12 inches from the plugs. Cable W2108 is fabricated from coaxial cable and should run direct to the jacks indicated. Table XVIII lists the fittings required to make up the cables.

TABLE XVIII. FITTINGS REQUIRED FOR CABLE FABRICATION, RADIO SET AN/ARC-21 WITH KEYER GROUP AN/ARA-26

Quantity	Plug Type	Adapter Type	Symbol
2	AN3108-22-14S	AN3057-12A	P2106-P2108
1	AN3108-20-27S	AN3057-12A	P2107
1	AN3106M-8S-1S	AN3057-3A	P2127
1	AN3106-24-11S	AN3057-16A	P2101
1	AN3106-22-4S	AN3057-12A	Mates with J2901
1	AN3106-16-9S	AN3057-8A	P2104
2	AN3106-14S-5S	AN3057-6A	P2123, P2136
1	AN3106-22-14P	AN3057-12A	P2124
1	AN3106-22-14S	AN3057-12A	P2125
1	AN3106-10-3S	AN3057-3A	P2141
1	AN3102A-24-28S	AN3057-16A	P2140
2	UG-59B/U	---	P2111-P2112
2	UG-88/U	---	P2113-P2117
1	97-3108-32-409P or HHB-2336	AN3057-20A or HHB-2604 and AN3057-12A	P2105
1	97-3106-28-425P or HHB-2469	AN3057-16A or HHB-2432	P2102
1	97-3108-28-426S or HHB-2338	AN3057-16A or HHB-2603	P2103
1	AN3106-18-4S	AN3057-10A	P2138
1	AN3106-18-1S	AN3057-10A	P2139

TABLE XIX. CABLE W2101. POWER SUPPLY TO MAIN BUS

Plug Designation	Circuit Description	Circuit Breaker Capacity
	DY-50/ARC-21	
P2101A	Not Used	---
P2101B	Not Used	---
P2101C	Not Used	---
P2101D	Ratchet and Relay Supply	20 amp
P2101E	Blower Motor and Low Voltage Dynamotor Supply	25 amp
P2101F	High Voltage Dynamotor and 4-65A Heater Supply	40 amp
P2101G	Not Used	---
P2101H	Ground	---
P2101I	Ground	---
	PP-298/ARC-21X or PP-1831/ARC	
P2101A	A-C Supply to Filament and Low Voltage Transformer	5 amp
P2101B	A-C Supply to High Voltage Transformer	10 amp
P2101C	A-C Common (ground)	---
P2101D	Ratchet and Relay Supply	20 amp
P2101E	Blower Motor and Heater Supply	15 amp
P2101F	Not Used	---
P2101G	Not Used	---
P2101H	Ground	---
P2101I	Ground	---

TABLE XX. CABLE W2102. POWER SUPPLY TO RECEIVER-TRANSMITTER RT-128A/ARC-21

Plug Designation	Circuit Description	Voltage to Ground	30 Ft. B&S No.	To Receiver-Transmitter
P2102A	+140 Supply	140	22	P2103A
P2102B	+400 Supply	400	22	P2103B
P2102C	Spare			
P2102D	Master On-Off	27.5	22	P2104C
P2102E	Mike Tip	27.5	22	P2103E
P2102F	High Voltage Control	27.5	22	P2103F
P2102H	+1000 Supply	1000	22	P2103H
P2102J	Bias Short	27.5	22	P2103J
P2102K	4-65A Filaments	27.5	14	P2103K
P2102L	Heaters (ac or dc)	27.5	14	P2103L
P2102M	-40 Modulator Bias	40	22	P2103M
P2102N	-18 Modulator Bias	20	22	P2103N
P2102P	-20 Receiver Bias	18	22	P2103P
P2102R	Spare			
P2102S	Heaters, dc	27.5	18	P2103S
P2102T	Blower Supply	27.5	14	P2104A
P2102U	Ratchet Supply	27.5	14	P2103U
P2102V	Relay Supply Paralleled	27.5	14	P2103V
P2102W	Motors	27.5	14	P2103W
	Ground	0	12	P2103T

The below listed leads separate from cable W2102 a distance of 18 inches from P2103 and connect to P2104, AN 3106-16-9S and are not routed through the junction box.

P2104A	Blower Supply	27.5	14	P2102T
P2104B	Spare			
P2104C	Master On-Off (Interlock)	27.5	22	P2102D
P2104D	Master On-Off (Interlock)	27.5	22	P2103D

NOTE: B&S No. 14 leads in above cable may be reduced to B&S No. 16 for length of less than 18 feet.

TABLE XXI. CABLE U-W2103. RECEIVER-TRANSMITTER RT-128A/ARC-21 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2105A	Controlled 27.5 Volts	27.5	16	3	P2106C
P2105B	Controlled 27.5 Volts Paralleled	27.5	16	3	P2106D
P2105C	Controlled 27.5 Volts	27.5	16	3	P2106E
P2105D	††Bridge, Supply (in)	27.5	16	4	P2140A
P2105E	Bridge, Units (in)	27.5	16	5	P2140F
P2105F	Bridge, Tens (in)	27.5	18	6	P2140G
P2105H	Bridge, Hundreds (in)	27.5	18	7	P2140H
P2105J	Bridge, Thousands (in)	27.5	16	8	P2140P
P2105K	Master On-Off	27.5	22	9	P2140E
P2105L	Take Control Trip Paralleled	27.5	16	10	P2107B
P2105M	Take Control Trip	27.5	16	10	P2107C
P2105N	Take Control Switching (in)	27.5	22	11	P2125L
P2105P	*Spare	27.5	16	44	P2110H
P2105R	Receiver Sensitivity	-	22	13	P2106F
P2105S	CW Tone Adjust	-	22	14	P2107A
P2105T	**Audio Output	-	22	15	P2107F
P2105U	CW Broad-Sharp Selector	27.5	22	16	P2106K
P2105V	CW/FSK-Voice Selector	27.5	22	17	P2125R
P2105W	Voice-FSK Selector	27.5	22	31	P2126B
P2105X	Hi-Lo Power Switch	27.5	22	19	P2125C
P2105Y	Spare	-	-	-	-
P2105Z	Start Cycle Switching (in)	27.5	22	21	P2125J
P2105AA	††Bridge Supply (in)	27.5	16	4	P2140J
P2105BB	Spare	-	-	-	-

TABLE XXI. CABLE U-W2103. RECEIVER-TRANSMITTER RT-128A/ARC-21 TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2105CC	Spare	-	-	-	-
P2105a	**Key	27.5	16	27	P2125B
P2105b	**Mike	-	22	28	-
P2105c	**Audio Common	-	22	29	-
P2105d	Mike Tip (Transmitter Control)	27.5	16	30	P2126C
P2105f	Modulator Lock Out	27.5	22	32	P2140M
P2105g	Keying Relay	27.5	18	33	P2110P
P2105h	Coder Control	27.5	22	34	P2110A
P2105i	Coder Control	27.5	22	35	P2110B
P2105j	Coder Control	27.5	22	36	P2110E
P2105k	Coder Control	27.5	22	37	P2110F
P2105m	Coder Control	27.5	22	38	P2110G
P2105n	Cable Load Relay, Hold	27.5	22	39	P2110F
P2105p	Cable Load Relay, Control	27.5	22	40	P2110G
P2105q	Capacitor Brake Control	27.5	16	41	P2110N
P2105r	Capacitor Motor Control	27.5	18	42	P2110W
P2105s	†Driver Cut-Off	20.0	22	43	P2110U
P2105t	Spare	-	-	-	-
P2105u	Transmit Finish Cycle	27.5	22	45	-
P2105v	140 d-c Supply	140	22	46	P2115N
P2105w	Homing Lock Out	27.5	22	44	P2110H
P2105x	Spare	-	-	-	-
P2105y	Spare	-	-	-	-
P2105z	Spare	-	-	-	-

**Shielded.
†Ground terminal 43 when antenna coupler is not used.
††P2105D and P2105AA paralleled.

TABLE XXII. CABLE W2104. RADIO SET CONTROL C-451A/ARC-21 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2106A	Ground	-	16	-	-
P2106B	Lamp Supply	27.5	22	1	-
P2106C	Controlled 27.5 Volts	27.5	16	3	P2105A
P2106D	Controlled 27.5 Volts Paralleled	27.5	16	3	P2105B
P2106E	Controlled 27.5 Volts	27.5	16	3	P2105C
P2106F	Receiver Sensitivity	-	22	13	P2105R
P2106G	Volume Control	-	22	12	Interphone
P2106H	Voice-FSK Selector	27.5	16	31	P2126A
P2106J	Spare	-	-	-	-
P2106K	CW Broad-Sharp Selector	27.5	22	16	P2105U
P2106L	Channel Selector L	27.5	22	22	P2108L
P2106M	Channel Selector M	27.5	22	23	P2108M
P2106N	Channel Selector N	27.5	22	24	P2108N
P2106P	Channel Selector P	27.5	22	25	P2108P
P2106R	Channel Selector R	27.5	22	26	P2108R
P2106S	Hi-Lo Power Switch	27.5	22	70	P2124C
P2106T	Start Cycle Switch (normal)	27.5	22	48	P2124J
P2106U	Spare	-	-	-	-
P2106V	Spare	-	-	-	-
P2107A	CW Tone Adjust	-	22	14	P2105S
P2107B	Take Control Trip Paralleled	27.5	16	10	P2105L
P2107C	Take Control Trip	27.5	16	10	P2105M
P2107D	Take Control Switch (normal)	27.5	22	55	P2124L
P2107E	Master On-Off	27.5	22	9	P2105K
P2107F	*Audio Output	-	22	15	P2105T

TABLE XXII. CABLE W2104. RADIO SET CONTROL C-451A/ARC-21 TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2107G	CW/FSK-Voice Selector	27.5	22	17	P2105V
P2107H	†Bridge Supply (out)	27.5	16	64	P2141B
P2107I	Bridge, Thousands (out)	27.5	16	59	P2140T
P2107J	Bridge, Hundreds (out)	27.5	18	58	P2140U
P2107K	Bridge, Tens (out)	27.5	18	57	P2140V
P2107L	Bridge, Units (out)	27.5	16	56	P2140W
P2107M	†Bridge, Supply (out)	27.5	16	64	P2141C
P2107N	Ground	-	16	-	-

*Shielded.

†P2107H and P2107M paralleled.

TABLE XXIII. CABLE W2105. RADIO SET CONTROL C-455/ARC TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2108A	Ground	-	16	-	-
P2108B	Lamp Supply	27.5	22	1	-
P2108C	Hi-Lo Power Switch	27.5	22	70	P212
P2108D	Receiver Sensitivity	-	22	13	P2105R
P2108E	Volume Control	-	22	12	P2106G
P2108F	Take Control Trip] Paralleled	27.5	16	10	P2106L
P2108G	Take Control Trip]	27.5	16	10	P2105M
P2108H	Take Control Switch (Normal)	27.5	22	55	P2124L
P2108J	Master On-Off	27.5	22	9	P2105K
P2108K	*Audio Output	-	22	15	P2105T
P2108L	Channel Selector L	27.5	22	22	P2106L
P2108M	Channel Selector M	27.5	22	23	P2106M
P2108N	Channel Selector N	27.5	22	24	P2106N
P2108P	Channel Selector P	27.5	22	25	P2106P
P2108R	Channel Selector P	27.5	22	26	P2106R
P2108S	Spare	-	-	-	-
P2108T	Spare	-	-	-	-
P2108U	Spare	-	-	-	-
P2108V	Spare	-	-	-	-
P2108L	Channel Selector L	27.5	22	22	P2106L
P2108M	Channel Selector M	27.5	22	23	P2106M
P2108N	Channel Selector N	27.5	22	24	P2106N
P2108P	Channel Selector P	27.5	22 *	25	P2106P
P2108R	Channel Selector P	27.5	22	26	P2106R
P2108S	Spare	-	-	-	-
P2108T	Spare	-	-	-	-
P2108U	Spare	-	-	-	-
P2108V	Spare	-	-	-	-

*Shielded.

TABLE XXIV. CABLE W2109 E.R.A. TYPE 3001A-2 or 3001B-2 ANTENNA COUPLER TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2138A	115-Volt a-c Supply (5-amp Circuit breaker)	115	14	65	-
P2138B	27.5-Volt d-c Supply (15-amp Circuit breaker)	27.5	14	2	-
P2138C	Ground	-	12	-	-
P2138D	Spare	-	-	-	-
P2139A	Driver Cut-Off	20.0	22	43	P2105s
P2139B	Hi-Lo Power Switching	27.5	22	70	P2104C
P2139C	Ground	-	12	-	-
P2139D	Keying Relay	27.5	22	33	P2105g
P2139E	Master On-Off	27.5	22	9	P2105K
P2139F	Cable Load Relay, Hold	27.5	22	39	P2105n
P2139G	Cable Load Relay, Control	27.5	22	40	P2105p
P2139H	Homing Lock Out	27.5	22	44	P2105w
P2139I	Spare	-	-	-	-
P2139J	Antenna Shorting Relay	27.5	14	49	P2127

TABLE XXV. CABLE W2115. CONTROL PANEL C-790/ARA-26 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2123A	Ground	0	20	-	-
P2123B	27.5 Volts, Switched (in)	27.5	22	60	P2140Y
P2123C	27.5 Volts, Direct	27.5	22	67	-
P2123D	27.5 Volts, Panel Lamp	27.5	22	2	-
P2123E	27.5 Volts, Relays	27.5	22	66	P2136E

TABLE XXVI. CABLE W2116. KEYER KY-65/ARA-26 or KY-65A/ARA-26 TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2124A					
P2124B	Key to Adapter, Keyer Group MX-1304/ARC-21	27.5	16	53	P2140B
P2124C	Hi-Lo Power Switching	27.5	22	70	P2108C
P2124D	Spare	-	-	-	-
P2124E	Spare	-	-	-	-
P2124F	Ground	-	22	-	-
P2124G	Normal Select	27.5	22	63	P2140M
P2124H	Keyer Select	27.5	22	62	P2140L
P2124J	Start Cycle Switch (normal)	27.5	22	48	P2106T
P2124K	Start Cycle Switch (Keyer)	27.5	22	47	P2140D
P2124L	Take Control Switch (normal)	27.5	22	55	P2107D
P2124M	Take Control Switch (Keyer)	27.5	22	54	P2140S
P2124N	Spare	-	-	-	-
P2124P	Spare	-	-	-	-
P2124R	Spare	-	-	-	-
P2124S	Spare	-	-	-	-
P2124T	Spare	-	-	-	-
P2124U	Spare	-	-	-	-
P2124V	Spare	-	-	-	-
P2125A	Ground	-	16	-	-

TABLE XXVI. CABLE W2116. KEYER KY-65/ARA-26 or KY-65A/ARA-26 TO JUNCTION BOX (continued)

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2125B	Key	27.5	16	27	P2105a
P2125C	Hi-Lo Power Switching	27.5	22	19	P2105X
P2125D	Spare	-	-	-	-
P2125E	Master On-Off	27.5	22	9	P2105K
P2125F	Spare	-	-	-	-
P2125G	Ground	0	20	-	-
P2125H	Spare	-	-	-	-
P2125J	Start Cycle Switch (in)	27.5	22	21	P2105Z
P2125K	Spare	-	-	-	-
P2125L	Take Control Switch (in)	27.5	22	11	P2105N
P2125M	Spare	-	-	-	-
P2125N	Audio Output	-	22	15	P2105T
P2125P	Volume Control	-	22	12	Interphone
P2125R	CW/FSK-Voice Select	27.5	22	17	P2105V
P2125S	Ground	-	22	-	-
P2125T	Spare	-	-	-	-
P2125U	Spare	-	-	-	-
P2125V	Spare	-	-	-	-
P2136A	Ground	-	20	-	-
P2136B	27.5 Volts to Keyer Motor	27.5	22	52	P2140Q
P2136C	27.5 Volts Direct	27.5	22	67	-
P2136D	Spare	-	-	-	-
P2136E	27.5 Volts to Relays	27.5	22	66	P2123E

TABLE XXVII. CABLE W2115. ADAPTER-KEYER GROUP MX-1394/ARC-21 AND MOUNTING MT-1555/C TO JUNCTION BOX

Plug Designation	Circuit Description	Voltage to Ground	150 Ft. B&S No.	Junction Box Terminal	To
P2140A	Bridge Supply (in)	27.5	16	4	P2105D
P2140B	Key	27.5	16	53	P2124B
P2140C	27.5 Volts (in)	27.5	16	67	-
P2140D	Start Cycle Switching (Keyer)	27.5	22	47	P2124K
P2140E	Ground	-	16	-	-
P2140F	Bridge Units (in)	27.5	16	5	P2105E
P2140G	Bridge Tens (in)	27.5	18	6	P2105F
P2140H	Bridge Hundreds (in)	27.5	18	7	P2105H
P2140J	Bridge Supply (in)	27.5	16	4	P2105AA
P2140K	Bridge Supply (adjust)	27.5	16	51	P2141A
P2140L	Keyer Select	27.5	22	62	P2141H
P2140M	Normal Select	27.5	22	63	P2124G
P2140N	Modulator Lock Out	27.5	22	32	P2105f
P2140P	Bridge Thousands (in)	27.5	16	8	P2105J
P2140Q	27.5 Volts to Keyer Motor	27.5	22	52	P2136B
P2140R	Key to J-37	27.5	16	61	J-37
P2140S	Take Control Switch (Keyer)	27.5	22	54	P2124M
P2140T	Bridge Thousands (out)	27.5	16	59	P2107I
P2140U	Bridge Hundreds (out)	27.5	18	58	P2107J
P2140V	Bridge Tens (out)	27.5	18	57	P2107K
P2140W	Bridge Units (out)	27.5	16	56	P2107L
P2140X	Spare	-	-	-	-
P2140Y	27.5 Volts (switched)	27.5	22	60	P2123B
P2140Z	Spare	-	-	-	-
P2141A	Bridge Supply (adjust)	27.5	16	51	P2140K
P2141B	Bridge Supply (adjust)	27.5	16	64	P2107H
P2141C	Bridge Supply (adjust)	27.5	16	64	P2107M

3-33. CABLE FROM POWER SOURCE TO INTERCONNECTING BOX J-520/U. Six leads are required for this cable including the two leads for the 27.5-volt connections between the cable and junction box. Wire size must be such as to supply rated line voltage, under full load conditions, measured at the tip jacks of the Interconnecting Box J-520/U. Maximum d-c load will be approximately 60 amperes and maximum a-c load will be approximately 15 amperes. Fabrication of the power source end of this cable will depend on the type of terminals used on the power source. A type AN3106-22-4S plug with adaptor AN3057-12A is required for the Interconnecting Box J-520/U end of the cable. Connect the 27.5-volt positive lead to pin B of the plug and the 27.5-volt negative lead to pin D and ground. Connect the 115-volt a-c lead from the high side of the power source to pin A of the plug and the lead from the low side of the power source to pins C and D. Splice the two remaining leads to the 27.5-volt supply leads and terminate the positive lead at the junction-box circuit breakers and the negative lead at the junction box ground.

3-34. CABLE W2101. This cable need only be fabricated if Interconnecting Box J-520/U is not used.

3-35. CABLE W2108. Use UG-59B/U plugs at both ends of RG-8/U cable. This cable connects the jack on the ERA Coupler, and jack J2001 on Receiver-Transmitter RT-128A/ARC-21. Run the cable direct.

3-36. CABLE W2119. Use plug AN 3106E-8S-1S and Adaptor AN 3057-3A for plug P2127 and a B and S number 16 wire to connect to terminal number 49 in the junction box. Plug P2127 connects to Relay. Solenoid RE-132/ARC-21 to its energizing source. A ground lead to the relay frame is needed to complete the relay circuit.

3-37. CABLE W2126. Use a UG-88/U plug on each end of RG-58/U cable. Run cable direct from the receiving antenna to jack J2002 on the Receiver-Transmitter RT-128A/ARC-21. The plug at the coupler end is P2113 and the plug at the receiver transmitter end is P2117.

3-38. TEST CABLES . (See figure 3-16.)

3-39. GENERAL. If Test Kit MK-136/ARC-21 is not available the following seven test cables will be required to enable trouble shooting the individual chassis when removed from the frame. These cables permit access to the various components while trouble shooting proceeds under normal operating conditions. Table XXVIII lists the materials required.

3-40. CABLE 1, COAXIAL. Use a 12-inch length of RG-58/U cable. At one end remove the outer cover for a distance of 15/16 inch. Remove the outer braid so 5/16 inch remains, projecting out of the outer cover. Next remove the insulator so the center conductor projects 5/32 inch. Round the end of the conductor with a fine toothed file. Slide a Burndy No. YPV128 ferrule over the braid until it is against the outer covering and flare the projecting braid back over the ferrule. Screw the male connector, RCA No. 8830394-502 over the cable insulation so it enters between the braid and cable insulation to a point where it is flush with the end of the cable insulation. Slide the ferrule forward so it comes against the hexagonal portion of the connector. Clamp the ferrule with Burndy Ratchet Hytool MR8PV. Mechanically expand a 3/4 inch length of vinyl sleeving and quickly slide sleeving over connector so the major portion is over the cable and one end is between the hexagonal portion of the connector and the loose coupling nut. Screw adaptor, female RCA No. 8828313-1, in the screw cap and tack solder in place.

3-41. Prepare the other end of the cable by first removing the outer cover to a distance of 7/16 inch. Trim the braid so that 5/16 inch extends beyond the outer cover. Slide a ferrule, Burndy, No. YPV128 over the braid and back against the outer cover. Flare the projecting braid back over the ferrule. Remove sufficient insulating material so that 5/32 inch of the bare center conductor projects. Solder contact, receptacle, RCA No. 8824729, to the projecting center conductor. Screw female connector, RCA No. 8824730-501 on the cable insulation until the contact receptacle is flush with the insulating material in the connector taking care that the other end of the connector comes between the cable insulator and braid. Slide the ferrule forward against the hexagonal portion of the connector. Secure the ferrule to the cable with the Burndy Ratchet Hytool MR8PV. Mechanically expand a 3/4-inch length of vinyl sleeving and quickly slide sleeving over connector so the major portion is over the cable and one end is between the hexagonal portion of the connector and the loose coupling nut. Screw adaptor, male, RCA No. 8828312-1 over the threaded portion of the connector and tack solder in place. The cable is now completed.

3-42. CABLES 2, 3, AND 4, SINGLE CONDUCTOR. These three cables are similar except that two are made with a 24-inch length of wire and one is made with a 10-inch length of wire. Use insulated wire consisting of 10 strands of 0.01 inch diameter wire. Strip and tin the wire and slide two pieces of 3/32-inch inside diameter sleeving, 1-1/2 inches long, on the wire. Solder a male connector plug type No. 1715 U. S. Engineering Co. on one end of each wire and a female connector plug type No. 1700-C U. S. Engineering Co. on the other end of each wire. Slide a piece of sleeving up to the shoulder of each connector. This completes cables 2, 3, and 4.

3-43. CABLE 5. Cut two 33-inch lengths of insulated wire consisting of sixteen 0.010-inch diameter strands and twelve 33-inch lengths of insulated wire consisting of seven 0.010 inch strands. Strip and tin all wires at each end for a distance of 1/4 inch. Hold the wires in a bundle and slide a 31-1/4-inch length of fiberglass sleeving of appropriate inside diameter over the wires. Leave an equal amount of wire protruding from each end. Slide the MRE-14H hoods over the sleeving, being careful to face them in the proper direction. Make up the cable using the MRE-14S-G receptacle on one end and the MRE-14P-G plug on the other end. Leads will go between respective pins in plug and receptacle (A to A, B to B). Be sure that the two heavy leads are connected from A to A and H to H.

3-44. Before soldering the leads to the terminals, slide 1/2-inch lengths of BH-649 sleeving over the leads to cover the terminals after soldering has been com-

TABLE XXVIII. MATERIALS REQUIRED FOR TEST CABLES

Item	Quantity	Description	Type	Manufacturer
Receptacle	2	34-contact, female	MRE 34S-G	Winchester Electronics
Plug	2	34-contact, male	MRE 34P-G	Winchester Electronics
Receptacle	1	14-contact, female	MRE 14S-G	Winchester Electronics
Plug	1	14-contact, male	MRE 14P-G	Winchester Electronics
Hood	2	For 34-contact plugs	MRE 34H	Winchester Electronics
Hood	2	For 34-contact plugs	MRE 34H with skirt	Winchester Electronics
Hood	2	For 34-contact plugs	MRE 34H without skirt	Winchester Electronics
Clip	2	Alligator type	Type No. 60	Mueller Elec. Co.
Terminal	8	4-40 hole, length about 1 inch, shakeproof	-	-
Connector plug	3	Male	No. 1715	U.S. Engineering Co.
Connector plug	3	Female	No. 1700-C	U.S. Engineering Co.
Connector	2	Female	A8824730-501	R.C.A. Victor Division
Connector	6	Male	A8830394-502	R.C.A. Victor Division
Contact Receptacle	2	Center contact	A8824729-1	R.C.A. Victor Division
Adapter	4	Male	A8828312-1	R.C.A. Victor Division
Adapter	2	Female	A8828313-1	R.C.A. Victor Division
Ferrule	6	Crimp Collar	YPV-128	Burndy Eng. Co.
Sleeving, Black	6	Flexible 0.133 in. dia and 1-1/2 in. long	Turbotherm No. 105	Wm. Brand & Co.
Sleeving, Black	2	Flexible 0.133 in. dia and 3/4 in. long	Turbotherm No. 105	Wm. Brand & Co.
Sleeving	100 in.	Fire resistant synthetic coated fiberglas 0.066 in. inside diameter	BH649	Bentley Harris Mfg. Co.
Sleeving	31-1/4 in.	Fire resistant, synthetic coated fiberglas. Appropriate diam for cable No. 5	-	-
Lock Washer	2	0.123 in. ID x 0.265 in. OD x 0.019 in. thick	-	-
Wire	3	Cable 12 in. long	RG-58 U	-
Wire	-	7 strands 0.010 insulated	-	-
Wire	-	10 strands 0.010 insulated	-	-
Wire	-	16 strands 0.010 insulated	-	-
Shielded Wire	-	7 strands 0.010 insulated	-	-
Shielded Wire	-	16 strands 0.010 insulated	-	-
Shield Braid	-	To cover 5-wire cable	-	-
Shield Braid	-	1/4 in. wide, 34-1/2 in. long	-	-
Shield Braid	-	1-1/4 in. wide, 10 in. long	-	-
Solder	-	-	60-40	-

pleted After soldering has been completed and the sleeving is in place over the terminal, slide the hoods over the plug and receptacle. Put the guide pins in the plug with the female pin at the "A" end and the male pin at the "P" end in such a manner as to secure the hood. When assembled, tighten the clamping screws on the hood. Assemble the receptacle the same way, but with the male pin going to the "A" end and the female pin at the "P" end. The cable is now completed.

3-45. CABLE 6. Cut the following listed wire in 33-inch lengths for fabrication into the cable.

a. 23 pieces of insulated wire consisting of seven strands of 0.010 inch diameter tinned copper wire.

b. 8 pieces of insulated wire consisting of sixteen strands of 0.010 inch diameter tinned copper wire.

c. 2 pieces of shielded wire consisting of sixteen strands of 0.010 inch diameter tinned copper wire.

d. 1 piece of shielded wire consisting of seven strands of 0.010 inch diameter tinned copper wire. Cut a piece of vinyl coated fibreglas sleeving 31 inches long to be used as an external sheath for the above listed wires.

3-46. Cover a group of five, seven-7-strand wires with appropriate size braided shield. The braid must be close woven and tight to the wires as possible. Braiding the shield directly on the bundle of wires is preferred. Make a bundle of the remaining listed wires and cover tightly with a 31-inch length of shield braid. Braid the shield directly on the bundle of wires if possible. Cover the two shielded bundles of wires using the 31-inch length of vinyl coated fiberglass sleeving with the leads extending the same distance from either end of the sleeving. Slide the MRE-34H hoods, without skirts, over each end of the cable being careful to face them in the right direction.

3-47. Cut back the shield of the shielded leads 3/4 inch at each end to form pigtails. Strip and tin all the leads a distance of 1/4 inch from the ends. Solder wires to corresponding terminals (A to A, B to B) of the MRE-34P-G plug and MRE-34S-G receptacle. Before soldering leads, slide a 1/2 inch length of BH-649 sleeving over each of the ends of the wires to cover the terminals after soldering is completed. Make sure the 16-strand unshielded wires connect to terminals A, B, C, D, H, J, P and R. The 16-strand shielded wires connect E and F. Use the 7-strand shielded wire for terminal KK. Connect the five wires in the braid to terminals W, AA, CC, JJ, and NN. Connect the remaining terminals using the 7-strand wire. On completion of soldering be sure to slide the sleeving over the terminals.

3-48. Cut the 10-inch length of 1/4-inch braid in half and solder a clip on one end of each piece. Solder a terminal that will fit a number 4 screw on the other end of each piece. Run one clip lead through each hood and clamp so the terminal end is inside the hood to be fastened under the guide pin. Solder all the shielded lead pigtails to a terminal so it can be clamped under the hood by the opposite guide pin. Assemble the hood to the plug with the male guide pin at the NN, MM end and the female guide pin at the A, B end. Install the clamping screws in the corners. Tighten the clamp with the clip lead under the clamp. Assemble the receptacle in the same manner except that the male guide pin is at the A, B end and the female guide pin is at the NN, MM end. This completes the cable.

3-49. CABLE 7, COAXIAL. Use a 12-inch length of RG-58/U cable. At one end remove the outer cover for a distance of 7/16 inch. Remove the outer braid so 5/16 inch remains, projecting out of the outer cover. Next remove the insulator so the center conductor projects 5/32 inch. Round the end of the center conductor with a fine tooth file. Slide a Burndy No. YPV128 over the braid until it is against the outer covering and flare the projecting braid back over the ferrule. Screw the male connector, RCA No. 8830394-502, over the cable insulation, so it enters between the braid and cable insulation. Slide the ferrule forward so it comes against the hexagonal portion of the connector. Clamp the ferrule with Burndy Ratchet Hytool MR8PV. Mechanically expand a 3/4-inch length of vinyl sleeving and quickly slide sleeving over connector so major portion is over the cable and one end is between the hexagonal portion of the connector and the loose coupling nut. Prepare the remaining end the same way and cable is completed. Two cables are required.

3-50. CABLE USAGE. Use cable 1 for connecting Amplifier-Filter Assembly AM-775A/ARC-21 to jack J1212 of Chassis, Receiver-Transmitter MX-1424A/ARC-21. Cable 1 is also used for interconnecting Amplifier-Detector AM-777A/ARC-21 to jacks J1215 and J1216 of Chassis, Receiver-Transmitter MX-1424A/ARC-21.

3-51. Use cables 2 and 3 for interconnecting Amplifier, Audio Frequency AM-773A/ARC-21 and Amplifier, Radio Frequency AM-274A/ARC-21. Use cable 4 for interconnecting Amplifier-Oscillator AM-776A/ARC-21 and Amplifier, Radio Frequency AM-774A/ARC-21. Use cable 5 for interconnecting Amplifier-Filter Assembly AM-775A/ARC-21 and Oscillator, Radio Frequency O-180A/ARC-21 and chassis, Receiver-Transmitter MX-1424A/ARC-21.

3-52. Use cable 6 for interconnecting all units having 34-pin connectors to Chassis, Receiver-Transmitter MX-1424A/ARC-21. Cable 7 is used to interconnect jacks J902 and J905 on Oscillator, Radio Frequency O-180A/ARC-21 to jacks J501 and J511 on Amplifier-Oscillator AM-776A/ARC-21 respectively.

SECTION IV

THEORY OF OPERATION

4-1. RECEIVER. (See figure 4-1.)

4-2. The receiver is of the superheterodyne type with double conversion for voice and frequency shift keying reception, and triple conversion for cw reception. This system gives optimum bandwidth for the different types of reception and excellent image rejection. The antenna stage V501, r-f stage V502, mixer stage V503, doubler, stage V504, and master oscillator stage V506 in Amplifier-Detector AM-777A/ARC-21 each have four slug-tuned coils to cover the operating range.

4-3. The incoming signal from the antenna transfer relay in the ERA coupler is fed into two cascade stages of r-f amplification. These stages are the antenna stage, V501, and the r-f stage, V502. The output of the second r-f stage is fed into mixer V503.

4-4. The mixer, V503, combines the r-f signal from tube V502 and the output signal of the doubler, V504 to give an i-f signal of 1,800 kilocycles. The doubler is driven by the master oscillator V506.

4-5. The 1800-kilocycle different-frequency signal is amplified by a single 1800-kilocycle i-f stage, V701, in Amplifier-Director AM-777A/ARC-21. This high intermediate frequency accounts largely for the good image rejection. The 1800-kilocycle output signal is fed into the 300-kilocycle mixer, V702, together with a 1500-kilocycle signal from the tripler, V710.

4-6. The tripler, V710, is excited by the 500-kilocycle reference oscillator, V901, in Oscillator, Radio Frequency O-180A/ARC-21 to produce an accurate frequency oscillator injection voltage of 1500 kilocycles. The 1500 and 1800-kilocycle frequencies are mixed in the 300-kilocycle mixer, V702, to get the 300-kilocycle second intermediate frequency.

4-7. VOICE AND FREQUENCY SHIFT KEYING SIGNALS. The output of the 300-kilocycle mixer is amplified by two i-f stages, V703 and V704. The frequency shift keying signals go directly to the frequency shift keying adaptor from i-f stage V704. For voice signals the output of tube V704 goes into the audio detector, V705A. The output of the audio detector, V705A, is coupled into the automatic noise limiter, V706A, through relay K701.

4-8. CW SIGNALS. The output of the 300-kilocycle mixer, V702, is amplified by the 300-kilocycle first i-f amplifier, V703, after which it is fed into the 105-kilocycle mixer, V712. The 105-kilocycle mixer also receives an injection frequency of 195 kilocycles from the 195-kilocycle oscillator, V711B.

4-9. The 195-kilocycle oscillator tube, V711, is a double triode; one section is the oscillator and the other is a frequency control tube. The tube acts as a variable reactance control as the grid bias is adjusted by the "CW TUNE" control in Radio Set Control C-451A /ARC-21. The adjustment covers a range of plus and minus four kilocycles. The frequency of the best note heard in the headphones is varied by the "CW TUNE" control in Radio Set Control C-451/ARC-21. The adjustment covers a range of plus and minus four kilocycles. The frequency of the beat note heard in the headphones is varied by the "CW TUNE" control.

4-10. The 105-kilocycle mixer output and the 106-kilocycle beat-frequency oscillator, V714B, output are mixed and amplified in the 105-kilocycle i-f amplifier, V713. The signal is detected in the cw detector, V714A, and then coupled into the radio amplifier, through relay K701.

4-11. MAGNETOSTRICTION FILTERS. The interstage coupling between tubes V702-V703 and V712-V713 is a mechanical filter, incorporating the principles of magnetostriction.

4-12. In this type of filter the signal is applied to a bar of magnetic material under the influence of a permanent-magnet field, The bar varies in length, in step with the applied signal, provided the electrical and mechanical resonant frequencies are similar. The mechanical vibration is then converted into an electrical signal at the filter output. Filter V701 operates in the 300-kilocycle range and filter V702 operates in the 105 kilocycle range.

4-13. Two degrees of selectivity are provided in the 105-kilocycle amplifier stage for "CW BROAD" and "CW SHARP" reception. Relay K702 removes the magnetostriction filter and places a resistive load coupling between the i-f coils, L716 and L719, for "CW BROAD" reception. Filter Y702 is inserted and resistor R758 is removed by relay K702 for "CW SHARP" operation.

4-14. The tuned circuit, Y703, of the 106-kilocycle beat-frequency oscillator, V714B, is also of the magnetostriction type but of different construction. Instead of serving as a filter, it is used to stabilize the oscillator frequency.

4-15. NOISE LIMITER AND AUDIO. The signal from the audio detector, V705A, is fed through a series-type noise-limiter, V706A, and then is amplified by a three-state audio amplifier consisting of tubes V707, V708A, and V709.

4-16. SQUELCH AND AVC. The squelch tube, V708B, receives its control voltage from the r-f avc detector, V705B, and biases off the first audio tube, V707, when no voice signals are being received. The "NOISE" control is a limited-range sensitivity control for adjusting noise background when no signal is present. The squelch operates only during voice reception.

4-17. The r-f avc detector, V705B, gets its input signal from the 300-kilocycle i-f amplifier output. After rectification, the pulsating current is filtered and amplified in a d-c amplifier, the r-f avc amplifier, V715. The amplifier output is cathode-coupled to the r-f avc control diode V706B. The output of this tube supplies the avc bias for the r-f and i-f tubes. One-half of tube V716 acts as an audio avc rectifier taking some signal voltage from the audio output tube V709. The rectified avc voltage is applied to cathode and suppressor grid of tube V707.

4-18. TRANSMITTER.

4-19. Three types of emission are available when operating from Radio Set Control C-451A/ARC-21. They are cw, voice, and frequency shift keying. Only voice operation is available from Radio Set control C-455/ARC.

4-20. The prime frequency is generated by the master oscillator, V506, in Amplifier-Oscillator AM-776A/ARC-21, in the range of 1.9 to 12.9 megacycles. Tuning is controlled by a frequency control system consisting of the Amplifier-Filter Assembly AM-775A/ARC-21 and Oscillator, Radio Frequency O-180A/ARC-21. Direct frequency control of the master oscillator is provided by a reactance tube, V505. Part of the master oscillator output supplies the receiver oscillator frequency and part is amplified in the buffer, V507.

4-21. The buffer output drives the balanced modulator consisting of two tubes V508 and V509. When operating as a cw or voice transmitter, a 900-kilocycle signal from the Oscillator, Radio Frequency O-180A/ARC-21 chassis is also applied to the balanced modulator. The difference of these two frequencies is selected in the output.

4-22. The master oscillator frequency is one-half the receiver converter injection frequency. The desired transmitter frequency is 1800 kilocycles lower than the receiver conversion frequency, since the first i-f stage operates at a frequency of 1800 kilocycles. The balanced modulator gives a 900-kilocycle difference in frequency, which is doubled in obtaining the final transmitter signal frequency.

4-23. For frequency shift keying the output of the frequency shift keying adaptor is fed to the 900-kilocycle mixer and then into the balanced modulator in place of the 900-kilocycle fixed frequency.

4-24. The output of the balance modulator is amplified in the first amplifier, V510, and then in the second amplifier, V511; after which its frequency is doubled in the push-push doubler tubes, V512 and V513, to give the output frequency. The signal now has sufficient amplitude and power to drive the 100-watt power amplifier stage consisting of tubes V401 and V402. The power amplifier output then goes to the antenna through the ERA Coupler.

4-25. The phase detector, V514, also located in the push-push box, provides the control voltages required for tuning the power amplifier stage. The phase detector produces a control voltage when the r-f grid and r-f plate voltages of the power amplifier are not displaced by 180 degrees. At the 180-degree displacement of the voltages no voltage is produced since this is the resonant condition. The phase detector output polarity is determined by whether the plate frequency is higher or lower than the frequency of the grid circuit. The d-c error voltage produced is amplified by the servo amplifier, Amplifier, Audio Frequency AM-773A/ARC-21, to a level sufficient to operate the magnetic clutch servo mechanism in the Amplifier, Radio Frequency AM-774A/ARC-21.

4-26. CW TRANSMISSION. For cw transmission, keying is accomplished by keying the 900-kilocycle input to the balanced modulator, first amplifier and second amplifier, and the screen grids of the push-push doublers. A protective resistor is inserted in the plate and screen supply of the power amplifier tubes when no excitation is present to keep within dissipation limits.

4-27. VOICE TRANSMISSION. For voice transmission, the signal is fed through a clipper, V101, in Amplifier, Audio Frequency AM-773A/ARC-21 to allow a high level of modulation and still prevent overmodulation. The clipper is followed by a coupling impedance, Z101, to round off the corners of the square waves produced and thereby prevent spurious sideband radiation.

4-28. The clipper output is amplified by amplifier V102 and converted into double-ended output for push-pull amplification by a phase-splitter, V103. The signal is then amplified by the driver tube V104 and coupled into the modulator tubes V105 and V106. The modulator tubes are transformer-coupled to the plates of the power amplifier tubes.

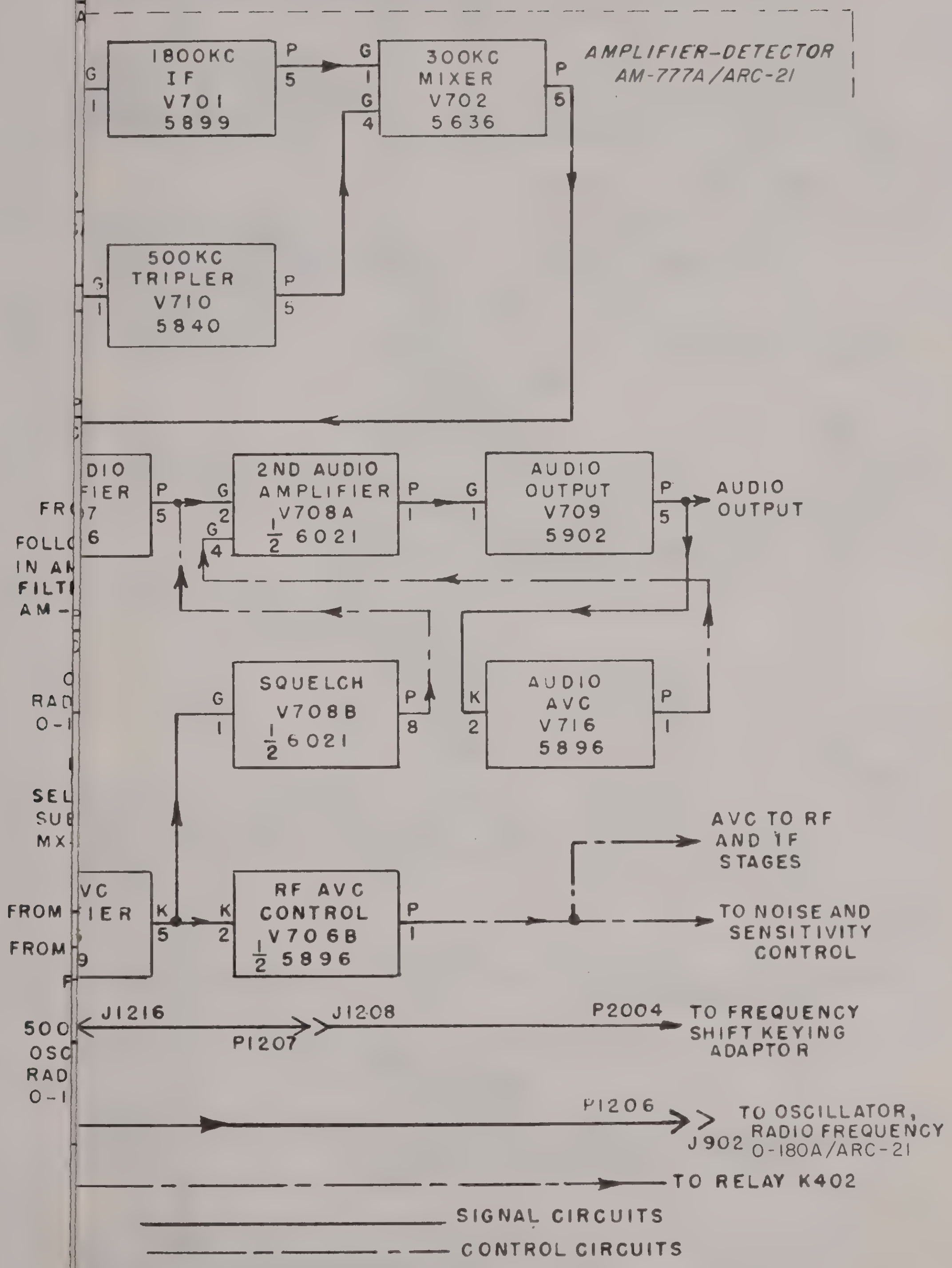
4-29. FREQUENCY SHIFT KEYING TRANSMISSION. The output of the frequency shift keying adaptor is fed into the 100-kilocycle stage to shift the frequency of the 900-kilocycle frequency signal. This gives, instead of a fixed 900-kilocycle shift input to the balanced modulator, a nominal 900-kilocycle frequency increasing and decreasing a small degree in step with the mark and space pulses from the teletypewriter.

4-30. The purpose and operation of the following listed tubes will be given in the descriptions of the power amplifier tuning operations.

Servo pre-amplifier	V109
Phase detector	V514
Dynamotor delay	V403
Transfer diode	V404
Transfer control amplifier	V405

4-31. FREQUENCY GENERATION AND CONTROL.

4-32. See the Frequency Control System Block Diagram figure 4-2. The frequency generating components except for the reactance tube and master oscillator, are located on two chassis: the Amplifier Filter As-


1800KC
IF
V701
5899
G
1
P
5
G
1
G
4
300KC
MIXER
V702
5636
P
6
AMPLIFIER-DETECTOR
AM-777A/ARC-21
500KC
TRIPLER
V710
5840
G
1
P
5
DIO
FIER
7
6
P
5
FR
FOLL
IN A
FILT
AM -
2ND AUDIO
AMPLIFIER
V708A
1/2 6021
G
2
G
4
P
1
G
1
AUDIO
OUTPUT
V709
5902
P
5
AUDIO
OUTPUT
SQUELCH
V708B
1/2 6021
G
1
P
8
K
2
AUDIO
AVC
V716
5896
P
1
O
RAD
O-1
SEL
SUB
MX
VC
IER
FROM
FROM
K
5
9
K
2
RF AVC
CONTROL
V706B
1/2 5896
P
1
AVC TO RF
AND IF
STAGES
TO NOISE AND
SENSITIVITY
CONTROL
500
OSC
RAD
O-1
J1216
P1207
J1208
P2004
TO FREQUENCY
SHIFT KEYING
ADAPTOR
P1206
J902
TO OSCILLATOR,
RADIO FREQUENCY
O-180A/ARC-21
TO RELAY K402
SIGNAL CIRCUITS
CONTROL CIRCUITS

. Radio Receiver-Transmitter RT-128A/ARC-21, Block Diagram from the 300-kilocycle i-f amplifier output. After rectification, the pulsating current is filtered and amplified in a d-c amplifier, the r-f avc amplifier, V715. The amplifier output is cathode-coupled to the r-f avc control diode V706B. The output of this tube supplies the avc bias for the r-f and i-f tubes. One-half of tube V716 acts as an audio avc rectifier taking some signal voltage from the audio output tube V709. The rectified avc voltage is applied to cathode and suppressor grid of tube V707.

4-18. TRANSMITTER.

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4-21. The buffer output drives the balanced modulator consisting of two tubes V508 and V509. When operating as a cw or voice transmitter, a 900-kilocycle signal from the Oscillator, Radio Frequency O-180A/ARC-21 chassis is also applied to the balanced modulator. The difference of these two frequencies is selected in the output.

4-22. The master oscillator frequency is one-half the receiver converter injection frequency. The desired transmitter frequency is 1800 kilocycles lower than the receiver conversion frequency, since the first i-f stage operates at a frequency of 1800 kilocycles. The balanced modulator gives a 900-kilocycle difference in frequency, which is doubled in obtaining the final transmitter signal frequency.

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Transfer control amplifier	V405

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4-32. See the Frequency Control System Block Diagram figure 4-2. The frequency generating components except for the reactance tube and master oscillator, are located on two chassis: the Amplifier Filter As-

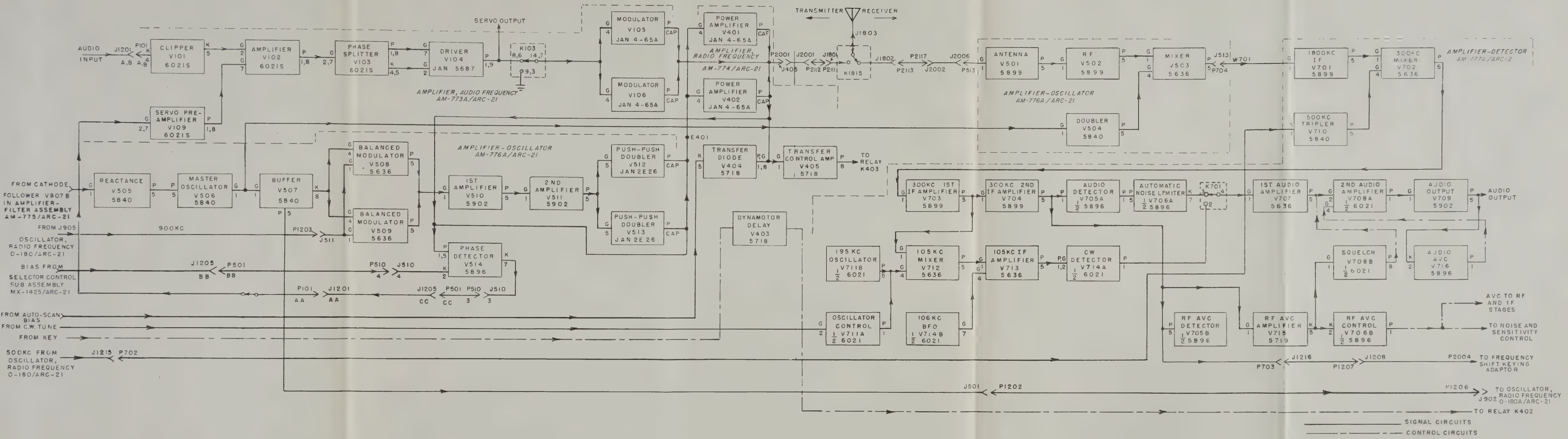
AUDIO INPUT
J1201
P101
A,B
CLIPPER V101 6021S
AMPLIFIER V102 6021S
PHASE SPLITTER V103 6021S
DRIVER V104 JAN 5687
SERVO OUTPUT
K103
AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21
SERVO PRE-AMPLIFIER V109 6021S
MODULATOR V105 JAN 4-65A
MODULATOR V106 JAN 4-65A
POWER AMPLIFIER V401 JAN 4-65A
POWER AMPLIFIER V402 JAN 4-65A
AMPLIFIER, RADIO FREQUENCY AM-774/ARC-21
E401
TRANSMITTER
RECEIVER
J1803
P2001
J2001
J1801
J1802
P2117
J2006
J405
P2112
P2111
K1815
P2113
J2002
P513
ANTENNA V501 5899
RF V502 5899
MIXER V503 5636
DOUBLER V504 5840
J513
W701
P704
AMPLIFIER-OSCILLATOR AM-776A/ARC-21
1800KC IF V701 5899
300KC MIXER V702 5636
500KC TRIPLER V710 5840
AMPLIFIER-DETECTOR AM-774/ARC-2
FROM CATHODE FOLLOWER V807B IN AMPLIFIER-FILTER ASSEMBLY AM-775/ARC-21
REACTANCE V505 5840
MASTER OSCILLATOR V506 5840
BUFFER V507 5840
BALANCED MODULATOR V508 5636
BALANCED MODULATOR V509 5636
AMPLIFIER-OSCILLATOR AM-776A/ARC-21
1ST AMPLIFIER V510 5902
2ND AMPLIFIER V511 5902
PUSH-PUSH DOUBLER V512 JAN 2E26
PUSH-PUSH DOUBLER V513 JAN 2E26
PHASE DETECTOR V514 5896
TRANSFER DIODE V404 5718
TRANSFER CONTROL AMP V405 5718
TO RELAY K403
DYNAMOTOR DELAY V403 5718
FROM J905 OSCILLATOR, RADIO FREQUENCY O-180/ARC-21
900KC
P1203
J511
BIAS FROM SELECTOR CONTROL SUB ASSEMBLY MX-1425/ARC-21
J1205 BB
P501 BB
P510 4
J510 4
P101 AA
J1201 AA
J1205 CC
P501 CC
P510 3
J510 3
FROM AUTO-SCAN BIAS
FROM C.W. TUNE
FROM KEY
500KC FROM OSCILLATOR, RADIO FREQUENCY O-180/ARC-21
J1215
P702
300KC 1ST IF AMPLIFIER V703 5899
300KC 2ND IF AMPLIFIER V704 5899
AUDIO DETECTOR V705A ½ 5896
AUTOMATIC NOISE LIMITER ½ V706A ½ 5896
K701
1ST AUDIO AMPLIFIER V707 5636
2ND AUDIO AMPLIFIER V708A ½ 6021
AUDIO OUTPUT V709 5902
AUDIO OUTPUT
195KC OSCILLATOR ½ V711B ½ 6021
105KC MIXER V712 5636
105KC IF AMPLIFIER V713 5636
CW DETECTOR ½ V714A ½ 6021
SQUELCH V708B ½ 6021
AUDIO AVC V716 5896
OSCILLATOR CONTROL ½ V711A ½ 6021
106KC BFO ½ V714B ½ 6021
RF AVC DETECTOR ½ V705B ½ 5896
RF AVC AMPLIFIER V715 5719
RF AVC CONTROL ½ V706B ½ 5896
AVC TO RF AND IF STAGES
TO NOISE AND SENSITIVITY CONTROL
P703
J1216
P1207
J1208
P2004
TO FREQUENCY SHIFT KEYING ADAPTOR
J501
P1202
P1206
J902
TO OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21
TO RELAY K402
SIGNAL CIRCUITS
CONTROL CIRCUITS

Figure 4-1. Radio Receiver-Transmitter RT-128A/ARC-21, Block Diagram

sembly AM-775A/ARC-21 and the Oscillator, Radio Frequency O-180A/ARC-21. These chassis function as a unit.

4-33. A portion of the output of the master oscillator V506 in Amplifier-Oscillator AM-776A/ARC-21 is fed into the frequency control circuits for control comparison. The frequency control circuits mix various switch-selected frequencies with the master oscillator frequency to give a nominal output frequency of 50 kilocycles which is then compared with an accurate 50-kilocycle fixed frequency in a phase discriminator.

4-34. Any difference in phase of the two 50-kilocycle signals produces a bias on the reactance tube, V505, to hold the master oscillator on frequency.

4-35. Control frequencies for the 44,000 operating frequencies are derived from the reference crystal oscillator and nine supplementary crystals in Oscillator, Radio Frequency O-180A/ARC-21. Only three crystal frequencies are used at one time. One crystal oscillator supplies a precise 500-kilocycle reference frequency, which is multiplied by a doubler and harmonic generator and divided by various dividers to give a wide range of fixed frequencies.

4-36. FREQUENCY CONTROL SYSTEM.

4-37. Included along with the theory is a practical frequency determination to show the working of the frequency system. The frequency control system controls the frequency of the master oscillator, so this frequency must be determined first.

4-38. DETERMINING THE MASTER OSCILLATOR FREQUENCY. Since the master oscillator frequency is doubled to give the receiver first conversion frequency, it will be one-half of the sum of the operating frequency and the first intermediate frequency:

$$\text{master oscillator frequency} = \frac{\text{receiver frequency + first if.}}{2}$$

4-39. For a typical frequency of 5453 kilocycles for the receiver and the first intermediate frequency of 1800 kilocycles the master oscillator frequency will be:

$$\frac{5453.0 + 1800}{2} = 3626.5 \text{ kilocycles}$$

4-40. THOUSANDS SELECTION. The master oscillator (V506) frequency and a switch-selected frequency from the harmonic generator, V909 in Oscillator, Radio Frequency O-180A/ARC-21 are mixed in the 600- to 1100-kilocycle mixer, V906. The harmonic generator output is amplified by the harmonic generator amplifier, V907. Since the sum of the frequencies could not be passed by the 600- to 1100-kilocycle bandpass, a difference frequency must be used. With a difference frequency limited to the range of 600 to 1100 kilocycles and since the harmonic generator has 500-kilocycle harmonics from 3000 to 13,500 kilocycles, it is evident that only one frequency is suitable, namely 4500 kilocycles:

4500.0 kilocycles, frequency selected from 500-kilocycle harmonic generator
-3626.5 kilocycles, frequency of master oscillator

873.5 kilocycles, output of mixer.

The 600- to 1100-kilocycle difference-frequency selector will be tuned to pass 850 to 900 kilocycles by the setting of the hundreds switch as set forth below.

4-41. HUNDREDS SELECTION. The output of 873.5 kilocycles developed as explained above is then fed into the second mixer together with a switch-selected frequency, available from 450 to 900 kilocycles in 50 kilocycle steps. The 50-kilocycle steps are derived from the 50-kilocycle harmonic generator comprising a 50-kilocycle multiplier, V810, and 450- to 900-kilocycle amplifier, V811 in Amplifier-Filter Assembly AM-775A/ARC-21. Since the bandpass frequency is lower than either input frequency we again take the difference frequency. The switch selected frequency is in 50-kilocycle steps and the total bandpass is 50 kilocycles wide, so only one frequency is suitable, namely, 700 kilocycles:

873.5 kilocycles, input from 600- to 1100-kilocycle bandpass
-700.0 kilocycles, selected by hundreds switch from 50-kilocycle harmonic generator

173.5 kilocycles, output from 2nd mixer.

Since there are 10 positions on the 150- to 200-kilocycle bandpass, the 170- to 175-kilocycle position will be selected. This selection is made by the tens selector.

4-42. TENS SELECTION. The 173.5-kilocycle output is fed into the third mixer, V802, together with a signal in the 35- to 80-kilocycle range from the 5-kilocycle harmonic generator. This latter signal is selected by the tens selector. Switch S807 selects one of the 10 circuits tuned, five kilocycles apart, in the plate circuit of the five-kilocycle multiplier, V817. Similar circuits are selected in the plate circuit of the 35- to 80-kilocycle amplifier, V816, by switch S806.

4-43. In this case the sum of the two frequencies must be used, since one signal will be in the 150- to 200-kilocycle range and the other signal will be in the 35- to 80-kilocycle range. The output signal must pass through a 230- to 235-kilocycle bandpass and the selected frequencies are five kilocycles apart, requiring a 60-kilocycle signal:

173.5 kilocycles, input from 150- to 200-kilocycle bandpass
+60.0 kilocycles, selected by tens switch from 5-kilocycle harmonic generator

233.5 kilocycles, output at third mixer.

This output then passes through the 230- to 235-kilocycle bandpass into the fourth mixer, V803.

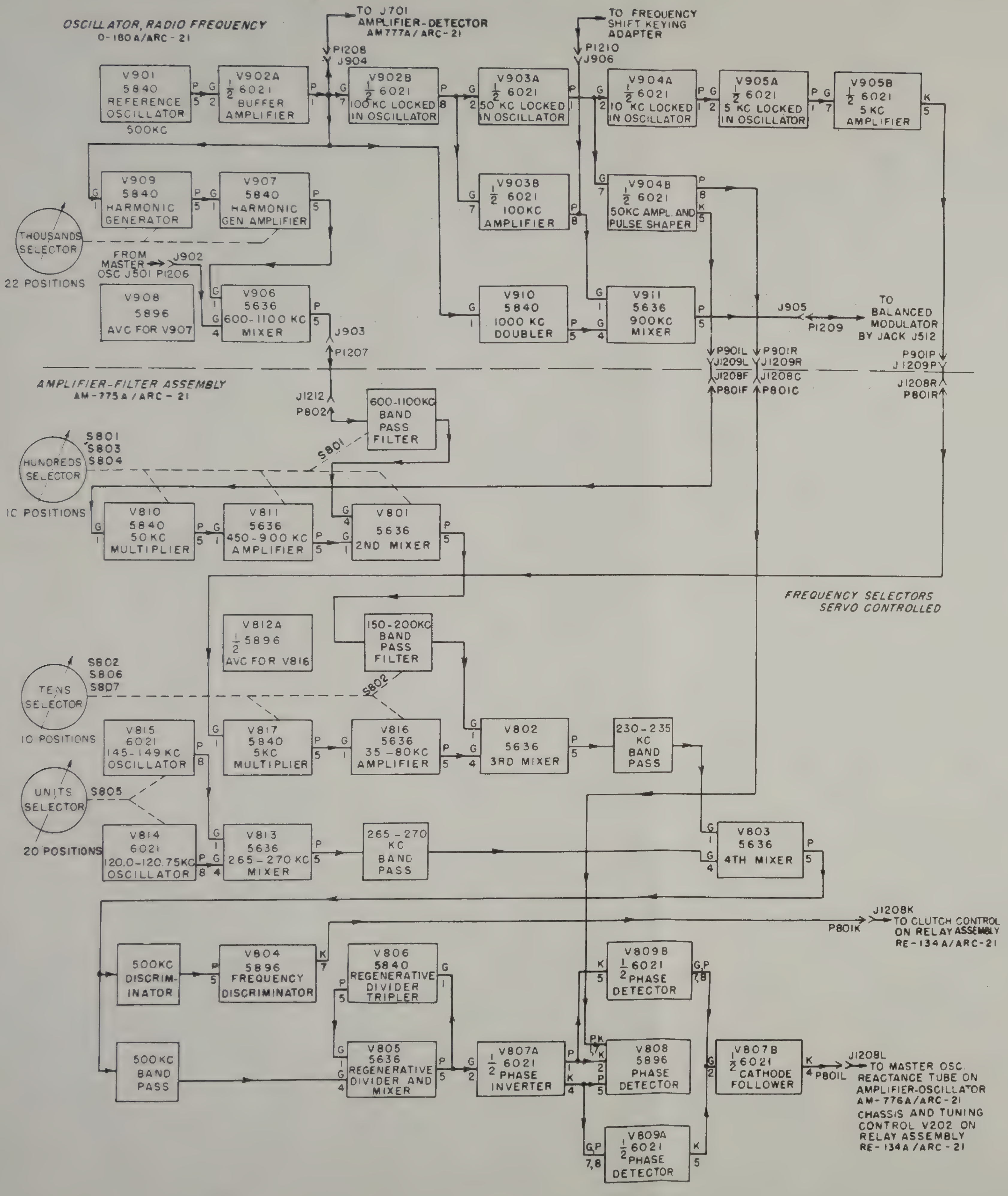
OSCILLATOR, RADIO FREQUENCY
O-180A/ARC-21
TO J701 AMPLIFIER-DETECTOR AM777A/ARC-21
P1208
J904
TO FREQUENCY SHIFT KEYING ADAPTER
P1210
J906
V901 5840 REFERENCE OSCILLATOR 500KC
V902A 1/2 6021 BUFFER AMPLIFIER
V902B 1/2 6021 100 KC LOCKED IN OSCILLATOR
V903A 1/2 6021 50 KC LOCKED IN OSCILLATOR
V904A 1/2 6021 10 KC LOCKED IN OSCILLATOR
V905A 1/2 6021 5 KC LOCKED IN OSCILLATOR
V905B 1/2 6021 5 KC AMPLIFIER
V909 5840 HARMONIC GENERATOR
V907 5840 HARMONIC GEN. AMPLIFIER
V903B 1/2 6021 100KC AMPLIFIER
V904B 1/2 6021 50KC AMPL. AND PULSE SHAPER
THOUSANDS SELECTOR
22 POSITIONS
FROM MASTER OSC J501 P1206
J902
V908 5896 AVC FOR V907
V906 5636 600-1100 KC MIXER
V910 5840 1000 KC DOUBLER
V911 5636 900KC MIXER
J903
P1207
J905
P1209
TO BALANCED MODULATOR BY JACK J512
P901L
J1209L
J1208F
P801F
P901R
J1209R
J1208C
P801C
P901P
J1209P
J1208R
P801R
AMPLIFIER-FILTER ASSEMBLY
AM-775A/ARC-21
J1212
P802
600-1100KC BAND PASS FILTER
S801
HUNDREDS SELECTOR
S801
S803
S804
10 POSITIONS
V810 5840 50KC MULTIPLIER
V811 5636 450-900 KC AMPLIFIER
V801 5636 2ND MIXER
FREQUENCY SELECTORS SERVO CONTROLLED
V812A 1/2 5896 AVC FOR V816
150-200KC BAND PASS FILTER
S802
TENS SELECTOR
S802
S806
S807
10 POSITIONS
V815 6021 145-149 KC OSCILLATOR
V817 5840 5KC MULTIPLIER
V816 5636 35-80KC AMPLIFIER
V802 5636 3RD MIXER
230-235 KC BAND PASS
UNITS SELECTOR
S805
20 POSITIONS
V814 6021 120.0-120.75KC OSCILLATOR
V813 5636 265-270 KC MIXER
265-270 KC BAND PASS
V803 5636 4TH MIXER
J1208K
P801K
TO CLUTCH CONTROL ON RELAY ASSEMBLY RE-134A/ARC-21
500KC DISCRIMINATOR
V804 5896 FREQUENCY DISCRIMINATOR
V806 5840 REGENERATIVE DIVIDER TRIPLER
V809B 1/2 6021 PHASE DETECTOR
500KC BAND PASS
V805 5636 REGENERATIVE DIVIDER AND MIXER
V807A 1/2 6021 PHASE INVERTER
V808 5896 PHASE DETECTOR
V807B 1/2 6021 CATHODE FOLLOWER
J1208L
P801L
TO MASTER OSC REACTANCE TUBE ON AMPLIFIER-OSCILLATOR AM-776A/ARC-21 CHASSIS AND TUNING CONTROL V202 ON RELAY ASSEMBLY RE-134A/ARC-21
V809A 1/2 6021 PHASE DETECTOR

Figure 4-2. Frequency Control System, Block Diagram

sembly AM-775A/ARC-21 and the Oscillator, Radio Frequency O-180A/ARC-21. These chassis function as a unit.

4-33. A portion of the output of the master oscillator V506 in Amplifier-Oscillator AM-776A/ARC-21 is fed into the frequency control circuits for control comparison. The frequency control circuits mix various switch-selected frequencies with the master oscillator frequency to give a nominal output frequency of 50 kilocycles which is then compared with an accurate 50-kilocycle fixed frequency in a phase discriminator.

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$$\text{master oscillator frequency} = \frac{\text{receiver frequency + first if.}}{2}$$

4-39. For a typical frequency of 5453 kilocycles for the receiver and the first intermediate frequency of 1800 kilocycles the master oscillator frequency will be:

$$\frac{5453.0 + 1800}{2} = 3626.5 \text{ kilocycles}$$

4-40. THOUSANDS SELECTION. The master oscillator (V506) frequency and a switch-selected frequency from the harmonic generator, V909 in Oscillator, Radio Frequency O-180A/ARC-21 are mixed in the 600- to 1100-kilocycle mixer, V906. The harmonic generator output is amplified by the harmonic generator amplifier, V907. Since the sum of the frequencies could not be passed by the 600- to 1100-kilocycle bandpass, a difference frequency must be used. With a difference frequency limited to the range of 600 to 1100 kilocycles and since the harmonic generator has 500-kilocycle harmonics from 3000 to 13,500 kilocycles, it is evident that only one frequency is suitable, namely 4500 kilocycles:

4500.0 kilocycles, frequency selected from 500-kilocycle harmonic generator
-3626.5 kilocycles, frequency of master oscillator

873.5 kilocycles, output of mixer.

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873.5 kilocycles, input from 600- to 1100-kilocycle bandpass
-700.0 kilocycles, selected by hundreds switch from 50-kilocycle harmonic generator

173.5 kilocycles, output from 2nd mixer.

Since there are 10 positions on the 150- to 200-kilocycle bandpass, the 170- to 175-kilocycle position will be selected. This selection is made by the tens selector.

4-42. TENS SELECTION. The 173.5-kilocycle output is fed into the third mixer, V802, together with a signal in the 35- to 80-kilocycle range from the 5-kilocycle harmonic generator. This latter signal is selected by the tens selector. Switch S807 selects one of the 10 circuits tuned, five kilocycles apart, in the plate circuit of the five-kilocycle multiplier, V817. Similar circuits are selected in the plate circuit of the 35- to 80-kilocycle amplifier, V816, by switch S806.

4-43. In this case the sum of the two frequencies must be used, since one signal will be in the 150- to 200-kilocycle range and the other signal will be in the 35- to 80-kilocycle range. The output signal must pass through a 230- to 235-kilocycle bandpass and the selected frequencies are five kilocycles apart, requiring a 60-kilocycle signal:

173.5 kilocycles, input from 150- to 200-kilocycle bandpass
+60.0 kilocycles, selected by tens switch from 5-kilocycle harmonic generator

233.5 kilocycles, output at third mixer.

This output then passes through the 230- to 235-kilocycle bandpass into the fourth mixer, V803.

4-44. UNITS SELECTION. The output of the third mixer, together with a frequency representing the units in the set-up frequency, is fed into the fourth mixer. The equivalent units frequency is derived from the sum of two frequencies each from a group of crystals. One group consists of four crystals having frequencies of 120, 120.25, 120.50, and 120.75 kilocycles. Crystals of the other group have frequencies of 145, 146, 147, 148, and 149 kilocycles.

4-45. The units switch, S805, selects the two crystals, one from each group, to give the required equivalent frequency. The actual frequencies selected are 120.5 and 146 kilocycles. These frequencies are mixed in the 265- to 270-kilocycle mixer, V813. The sum of these two frequencies is selected by the 265- to 270-kilocycle bandpass filter, giving an output of 266.5 kilocycles.

120.5 kilocycles, crystal oscillator, V814, frequency
+146.0 kilocycles, crystal oscillator, V715, frequency

266.5 kilocycles, selected output of 265- to 270-kilocycle mixer.

4-46. The 233.5-kilocycle output of the third mixer and the 266.5 kilocycle output are fed into the fourth mixer, V803.

266.5 kilocycles, from 265- to 270-kilocycle mixer

+ 233.5 kilocycles, from third mixer

500.0 kilocycles, output of fourth mixer.

4-47. The 500-kilocycle signal is now fed into a 10-to-1 regenerative divider and mixer system consisting of tubes V805 and V806. The 50-kilocycle regenerative divider and mixer output is fed into a phase detector to be compared to a 50-kilocycle signal from the reference crystal and fixed divider. Any variation of phase causes a bias voltage to be developed by the phase detector. The phase detector consists of tubes V808 and V809.

4-48. The d-c voltage developed in the phase detector is coupled to the reactance tube, V505, through a cathode follower, V807B. This voltage is then used to bias the reactance tube controlling the master oscillator frequency.

4-49. RECEIVER TUNING CYCLE. (See figure 4-3.)

4-50. The receiver tuning cycle, comprising the operations of homing and tuning, takes place whenever the equipment has been turned on, after a channel change on the "CHANNEL" switch, or when another radio set control takes control.

4-51. HOMING. (See figure 4-4.) Before tuning takes place the tuning components return to the low-frequency end of their tuning range. This is initiated by the start cycle switch, S1309, in the Radio Set Control C-451A/ARC-21 applying a start cycle pulse to the start relay K203 in Relay Assembly RE-134A/ARC-21. This applies receiver cycle power of 27.5 volts through contacts 3 and 4. At the same time, the stop relay K204 is energized through relay K203 contacts 1 and 11 and relay K206 contacts 3 and 5. Relay K204 is now locked in by the holding voltage developed from the a-c or d-c heater supply which is rectified by selenium rectifier, CR201. This is necessary in order to retain cycle power, after decay of the start pulse until completion of the receiver tuning cycle.

4-52. The frequency selecting bridge networks (see figure 4-5) are now unbalanced due to selection of a new channel. With the bridges unbalanced and cycle power applied, relays K601, K602, K603, and K604 in Selector Control Subassembly MX-1425B/ARC-21 will be closed, placing 27.5 volts on each friction clutch solenoid for the units B606, "tens" B607, "hundreds" B608, and "thousands" B609, respectively. With the friction clutch solenoids energized, each will ground selector motor, B3605, through relays K605 and K606 causing it to turn and balance the four bridges. Each clutch will remain engaged until its associated bridge is balanced.

4-53. The selector motor, B3605, ground is retained until all the solenoids are deenergized. However, as soon as a bridge is balanced, its associated relay will be deenergized, deenergizing the associated friction clutch solenoid; this, in turn, mechanically locks the switch drive and removes the 27.5-volt supply from relay K605 when all four clutch solenoids are deenergized. The motor will continue running until the last of the bridges is balanced, after which relays K601, K602, K603 and K604 will be open. Relay K605 then opens, deenergizing relay K606, stopping the motor. Resistor R625 and capacitor C606 delay the stopping of the motor momentarily, assuring that all selectors are properly seated and locked.

4-54. Relay K606 now provides ground return for relay K502 which is completed through band switches S501 and S604. When relay K502 is thus energized, the band selector motor B502 receives 27.5 volts and will run. The motor will turn the band switch S501 until the nearest of the two gaps on the switch rotor is aligned with the grounded arm. This removes the ground from relay K502 which, in turn, removes the 27.5-volt supply from the band selector motor and applies braking action through the back contacts, 3 and 4, of relay K502.

4-55. During this time tuning motor B501, in Amplifier-Oscillator AM-776A/ARC-21 was connected through relay K206, contacts 7 and 13, and the low-frequency limit switch, S503, to the cycle power (+27.5 volts). Relay K501, which controls the direction of the motor, is also energized through relay K504, contacts 3 and 5. Clutch O501 is energized through relay K201, contacts 7 and 8. Tuning homes to the low-frequency end and opens contacts of limit switch S503. This completes the receiver homing cycle.

4-56. RECEIVER TUNE. If warm-up, band switching, and bridge selection are completed, relays K503 and K502 will be deenergized. This will ground relay K504 through the high-frequency limit switch S502 and will energize K504, locking it in by contacts 2 and 12. Relay K202 is energized through contacts 6 and 7 on relay K504, and contacts 3 and 4 of relay K201. This will en-

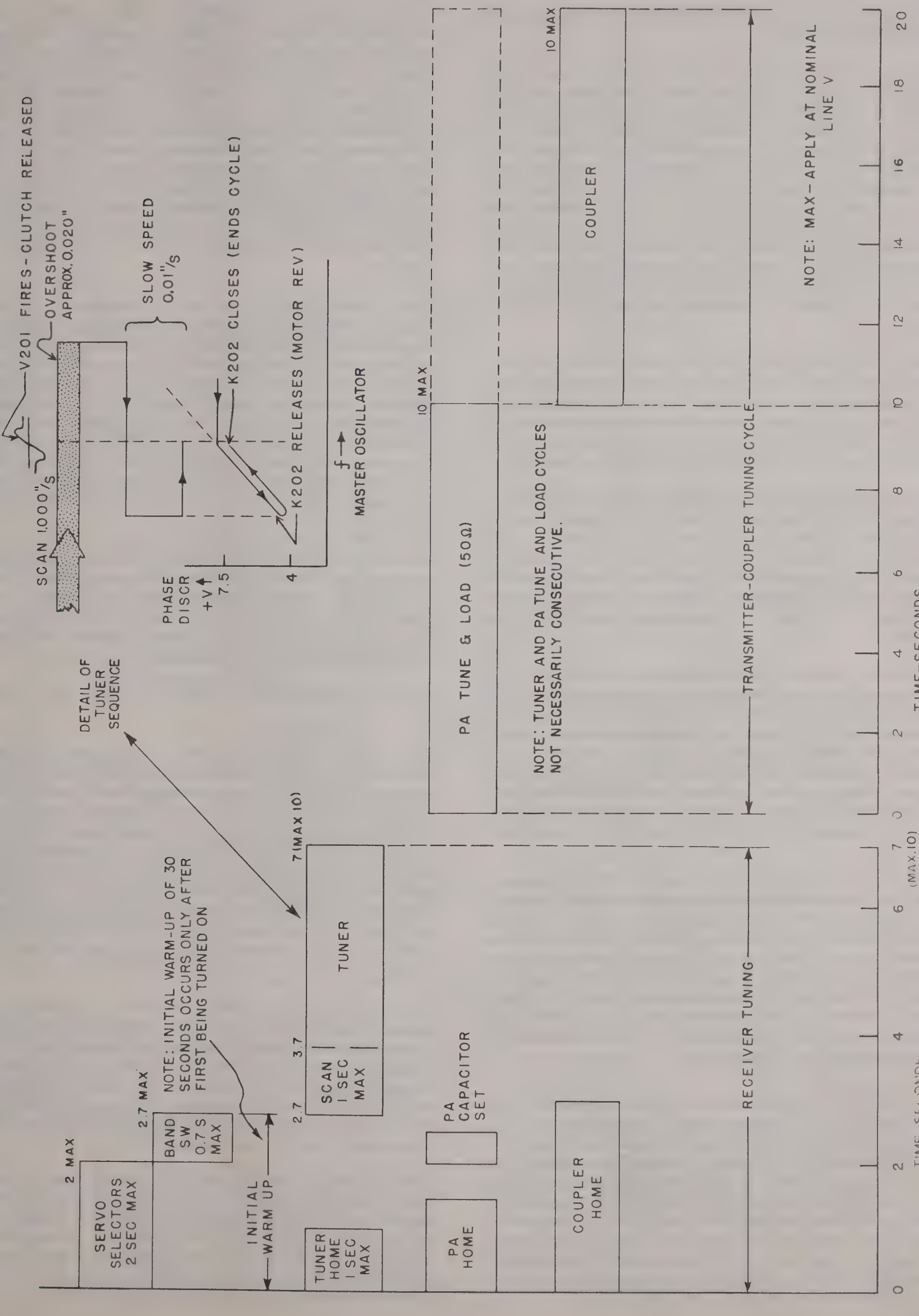
SERVO SELECTORS 2 SEC MAX
2 MAX
BAND SW 0.7 S MAX
2.7 MAX
INITIAL WARM UP
NOTE: INITIAL WARM-UP OF 30 SECONDS OCCURS ONLY AFTER FIRST BEING TURNED ON
TUNER HOME 1 SEC MAX
SCAN 1 SEC MAX
2.7
3.7
TUNER
7 (MAX 10)
DETAIL OF TUNER SEQUENCE
SCAN 1.000"/S
V201 FIRES-CLUTCH RELEASED
OVERSHOOT APPROX. 0.020"
SLOW SPEED 0.01"/S
K202 CLOSES (ENDS CYCLE)
K202 RELEASES (MOTOR REV)
PHASE DISCR +V
7.5
4
f
MASTER OSCILLATOR
PA HOME
PA CAPACITOR SET
PA TUNE & LOAD (50Ω)
10 MAX
NOTE: TUNER AND PA TUNE AND LOAD CYCLES NOT NECESSARILY CONSECUTIVE.
COUPLER HOME
COUPLER
10 MAX
RECEIVER TUNING
TRANSMITTER-COUPLER TUNING CYCLE
NOTE: MAX - APPLY AT NOMINAL LINE V
0
2
4
6
7 (MAX. 10)
TIME SECONDS
0
2
4
6
8
10
12
14
16
18
20
TIME-SECONDS

Figure 4-3. Radio Set AN/ARC-21, Automatic Tuning Sequence

ergize relay K205 and deenergize the tuning motor direction relay K501.

4-57. The tuning motor is now energized through relay K206, contacts 7 and 13, and relay K504, contacts 4 and 5. Since clutch O501 is still energized, the tuning motor will reverse and scan toward the high-frequency end of travel at high speed (approximately one inch per second). As correct tuning is approached, the frequency of the output of 4th mixer (V803 is Amplifier-Filter Assembly AM-775A/ARC-21) rapidly approaches 500 kilocycles. A positive output pulse is developed in the frequency discriminator Z805 and V804 as the signal passes the 500-kc center frequency. This pulse triggers thyratron V201, causing it to conduct and energize relay K201, thereby releasing the solenoid of clutch O501.

4-58. The slow-speed reverse clutch is now actuated, reversing and slowing down the tuning drive 100 to 1. As the oscillator frequency slowly proceeds back (because of overshoot) toward the correct tuning point the reactance tube V505 will take control over the oscillator tube V506, locking it to the correct frequency.

4-59. This control is derived as follows: The 500-kilocycle signal in discriminator Z805 also occurs in transformer Z804, from which it is applied to a regenerative frequency divider developing a 50-kilocycle signal in impedance Z806. This 50-kilocycle signal is compared in a phase discriminator (consisting of tubes V808 and V809) with a 50-kilocycle signal from tube V904B.

4-60. The output of this phase discriminator is a d-c error voltage whose magnitude and polarity are a function of the relative phase between the two 50-kilocycle signals. This d-c error voltage is applied to the reactance tube V505, locking the oscillator tube V506 to the correct frequency as previously mentioned. The d-c error voltage is also applied to the tuning control tube V202, being sufficiently positive so that tube V202 conducts, keeping relays K202 and K205 energized.

4-61. As the tuning continues toward the low-frequency end, the discriminator phase becomes such as to lower the voltage on the tuning control tube, V202. This will cut off the tube and de-energize relay K202, also releasing relay K205. Relay K205 will now close relay K206 through contacts 6 and 8 of relay K201, contacts 2 and 11 of relay K205, and contacts 8 and 14 of relay K504. The motor reversing relay K501 is again closed, so tuning reverses and proceeds in slow speed toward the high frequency tuning point.

4-62. As the correct tuning point is approached, the discriminator d-c voltage rises to approximately +7.5 volts, causing tube V202 again to conduct and close relays K202 and K205. Closing of relay K205 removes the 27.5-volt supply from motor B501 and shorts the motor to ground through relays K205 and K206, dynamically braking it. Since relays K205 and K206 are both energized, the ground is removed from the stop relay K204, releasing it and breaking the holding circuit to the start relay K203. Relay K203 now opens and removes the cycle power, completing the tuning cycle.

4-63. FREQUENCY CONTROL MONITORING AND AUTOMATIC RECYCLE. After completion of the normal receiver tuning cycle the frequency is continually monitored by the thyratron, V201, in the Relay Assembly RE-134A/ARC-21. This is accomplished by connecting the grid of the thyratron, V201, to monitor the grid bias of the regenerative divider tube, V806, located in the Amplifier Filter Assembly, AM-775A/ARC-21. Release of relay K203 closes contacts 7 and 14 connecting the regenerative frequency divider, V806, grid bias to the grid of the thyratron. Contacts 9 and 10 of the same relay apply a plate voltage of 75 volts. Relay K204 removes the cathode bias from tube V201 on release.

4-64. During normal periods of reception and transmission with the equipment on frequency, sufficient negative bias (approximately -1.5 volts) is maintained on the grid of the thyratron V201 to prevent it from firing. When abnormal frequency control conditions develop, which may result from tube or component failures, abnormally low supply voltage, or other reasons, the regenerative divider (V806) bias drops and thyratron V201 conducts, closing relay K201, thereby applying a ground to relay K207 through contacts 2 and 4 of relay K201 and contacts 5 and 6 of relay K203.

4-65. Relay K207, thus energized, applies 27.5 volts on the "start cycle" lead, initiating a retune cycle. This retunes the receiver and, when the telegraph key or microphone "push-to-talk" button is pressed, the transmitter will retune. If, after several recycling attempts, the abnormal conditions persist, the timer cycle will turn the equipment off.

4-66. TRANSMITTER TUNING CYCLE. (See figure 4-3.)

4-67. GENERAL. (See figure 4-1.) Transmitter tuning is in reality power amplifier tuning, since tuning of the various stages up to the power amplifier is completed during the receiver tuning period. All the receiver and transmitter stages, except the power amplifier, are gangtuned by the permeability tuner. The power amplifier stage contains a pair of type 4-65A tetrodes, V401 and V402 in Amplifier Radio Frequency AM-774A/ARC-21, functioning as parallel-connected class C amplifiers. With an input power of 220 milliamperes at 1000 volts, the nominal output is approximately 125 watts.

4-68. The cycle of operations for the transmitter is broken down into the following steps operating in the order named: homing, scanning, and tuning. Loading is considered a part of the tuning step. Certain tuning variations occur in tuning for the various types of emission and in the frequency ranges of 2 to 4.9995 megacycles and 5 to 23.9995 megacycles which will be discussed in their proper sequence.

4-69. HOMING. (See figure 4-6.) When the receiver cycle power is applied to start the receiver tuning sequence, it also energizes relay K317 in Relay Assembly RE-136A/ARC-21 to start the transmitter homing cycle. Relay K317 energizes the homing relay K315 which in turn energizes the tuning motor scan relay K311 and the coil direction relay K306.

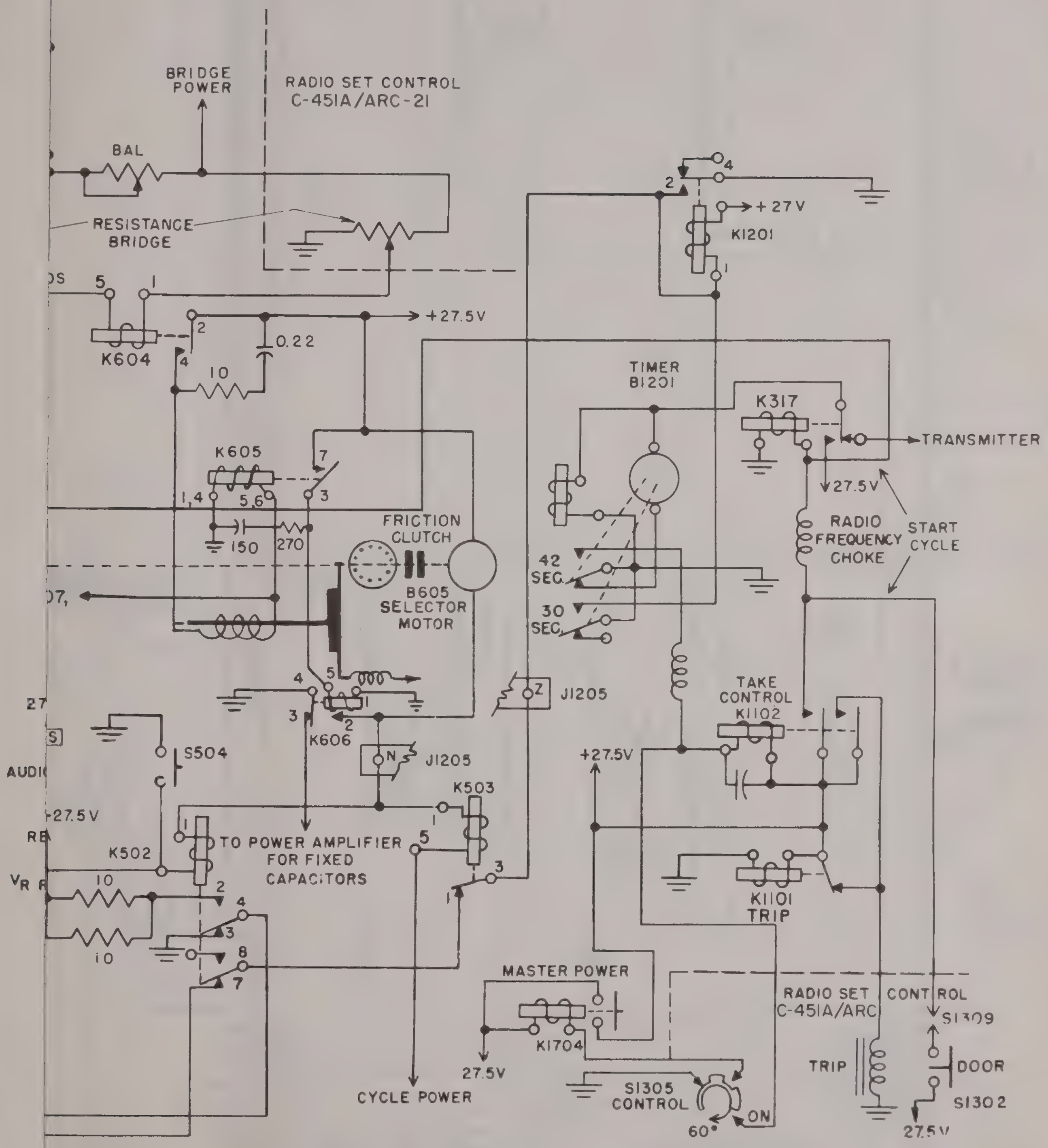
BRIDGE POWER
RADIO SET CONTROL C-451A/ARC-21
BAL
RESISTANCE BRIDGE
DS
5
1
2
4
+27.5V
0.22
K604
10
K605
7
1,4
5,6
3
150
270
FRICTION CLUTCH
B605 SELECTOR MOTOR
D7,
27
S
AUDI
+27.5V
RE
K502
VR F
S504
C
4
5
3
2
K606
J1205
Z
N
K503
1
5
3
TO POWER AMPLIFIER FOR FIXED CAPACITORS
10
10
2
4
3
8
7
CYCLE POWER
TIMER B1201
42 SEC.
30 SEC.
K1201
+27V
4
2
1
K317
TRANSMITTER
27.5V
RADIO FREQUENCY CHOKE
START CYCLE
TAKE CONTROL K1102
+27.5V
K1101 TRIP
MASTER POWER
K1704
27.5V
S1305 CONTROL
60°
ON
RADIO SET CONTROL C-451A/ARC
S1309
TRIP
DOOR
S1302
27.5V

Figure 4-4. Simplified Schematic, Receiver Tuning Radio Set AN/ARC-21

ergize relay K205 and deenergize the tuning motor direction relay K501.

4-57. The tuning motor is now energized through relay K206, contacts 7 and 13, and relay K504, contacts 4 and 5. Since clutch O501 is still energized, the tuning motor will reverse and scan toward the high-frequency end of travel at high speed (approximately one inch per second). As correct tuning is approached, the frequency of the output of 4th mixer (V803 is Amplifier-Filter Assembly AM-775A/ARC-21) rapidly approaches 500 kilocycles. A positive output pulse is developed in the frequency discriminator Z805 and V804 as the signal passes the 500-kc center frequency. This pulse triggers thyratron V201, causing it to conduct and energize relay K201, thereby releasing the solenoid of clutch O501.

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4-62. As the correct tuning point is approached, the discriminator d-c voltage rises to approximately +7.5 volts, causing tube V202 again to conduct and close relays K202 and K205. Closing of relay K205 removes the 27.5-volt supply from motor B501 and shorts the motor to ground through relays K205 and K206, dynamically braking it. Since relays K205 and K206 are both energized, the ground is removed from the stop relay K204, releasing it and breaking the holding circuit to the start relay K203. Relay K203 now opens and removes the cycle power, completing the tuning cycle.

4-63. FREQUENCY CONTROL MONITORING AND AUTOMATIC RECYCLE. After completion of the normal receiver tuning cycle the frequency is continually monitored by the thyratron, V201, in the Relay Assembly RE-134A/ARC-21. This is accomplished by connecting the grid of the thyratron, V201, to monitor the grid bias of the regenerative divider tube, V806, located in the Amplifier Filter Assembly, AM-775A/ARC-21. Release of relay K203 closes contacts 7 and 14 connecting the regenerative frequency divider, V806, grid bias to the grid of the thyratron. Contacts 9 and 10 of the same relay apply a plate voltage of 75 volts. Relay K204 removes the cathode bias from tube V201 on release.

4-64. During normal periods of reception and transmission with the equipment on frequency, sufficient negative bias (approximately -1.5 volts) is maintained on the grid of the thyratron V201 to prevent it from firing. When abnormal frequency control conditions develop, which may result from tube or component failures, abnormally low supply voltage, or other reasons, the regenerative divider (V806) bias drops and thyratron V201 conducts, closing relay K201, thereby applying a ground to relay K207 through contacts 2 and 4 of relay K201 and contacts 5 and 6 of relay K203.

4-65. Relay K207, thus energized, applies 27.5 volts on the "start cycle" lead, initiating a retune cycle. This retunes the receiver and, when the telegraph key or microphone "push-to-talk" button is pressed, the transmitter will retune. If, after several recycling attempts, the abnormal conditions persist, the timer cycle will turn the equipment off.

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4-68. The cycle of operations for the transmitter is broken down into the following steps operating in the order named: homing, scanning, and tuning. Loading is considered a part of the tuning step. Certain tuning variations occur in tuning for the various types of emission and in the frequency ranges of 2 to 4.9995 megacycles and 5 to 23.9995 megacycles which will be discussed in their proper sequence.

4-69. HOMING. (See figure 4-6.) When the receiver cycle power is applied to start the receiver tuning sequence, it also energizes relay K317 in Relay Assembly RE-136A/ARC-21 to start the transmitter homing cycle. Relay K317 energizes the homing relay K315 which in turn energizes the tuning motor scan relay K311 and the coil direction relay K306.

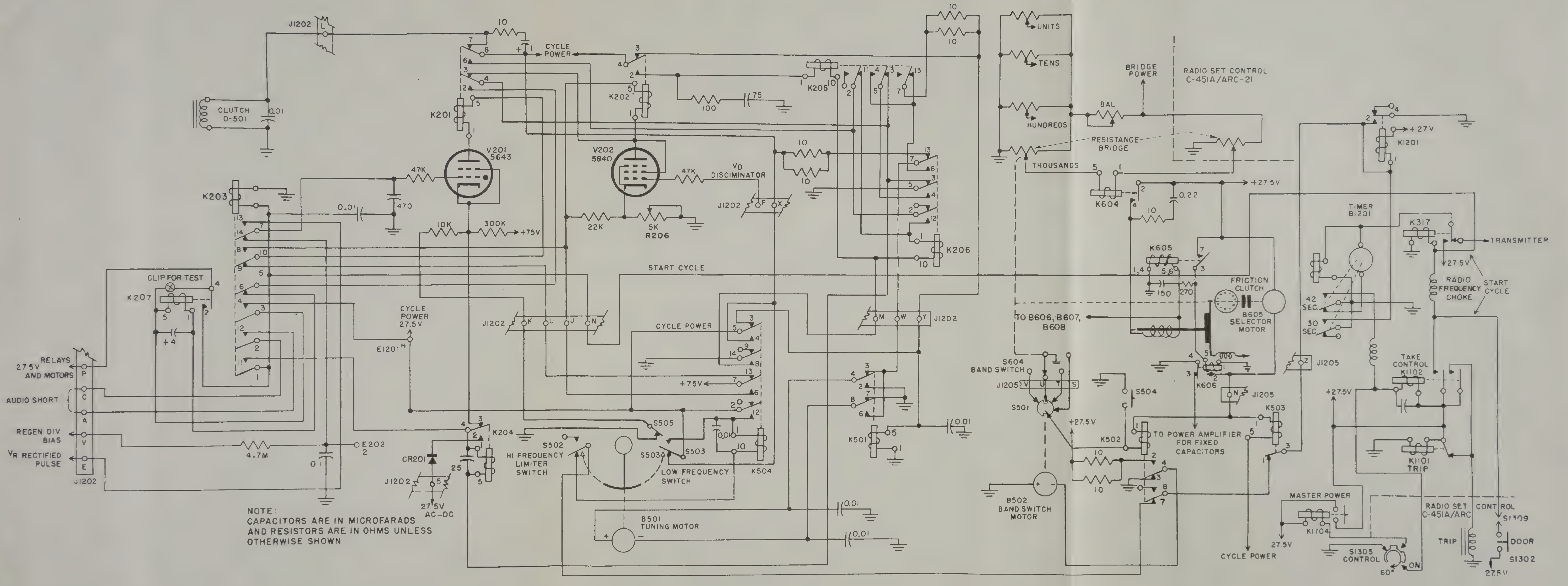
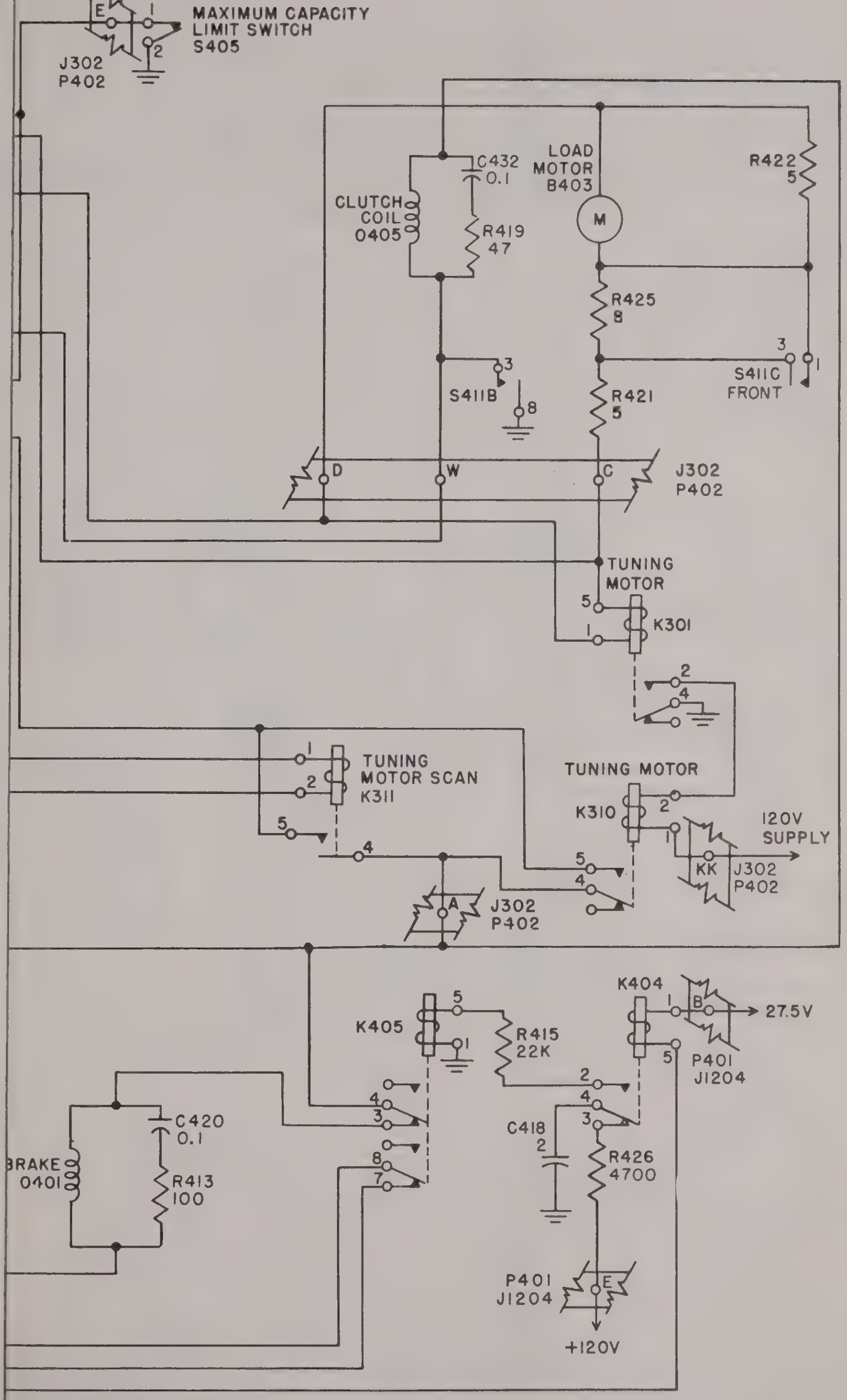

J1202
CLUTCH
O-501
0.01
10
CYCLE POWER
K201
V201
5643
V202
5840
K202
K203
K205
K206
K207
CLIP FOR TEST
47K
470
0.01
10K
300K
+75V
22K
5K
R206
100
75
VD DISCIMINATOR
START CYCLE
CYCLE POWER
27.5V
E1201
J1202
RELAYS
27.5V
AND MOTORS
AUDIO SHORT
REGEN DIV
BIAS
VR RECTIFIED
PULSE
4.7M
E202
0.1
+75V
K204
CR201
25
27.5V
AC-DC
S502
HI FREQUENCY
LIMITER
SWITCH
S505
S503
LOW FREQUENCY
SWITCH
K504
K501
0.01
B501
TUNING MOTOR
NOTE:
CAPACITORS ARE IN MICROFARADS
AND RESISTORS ARE IN OHMS UNLESS
OTHERWISE SHOWN
UNITS
TENS
HUNDREDS
THOUSANDS
RESISTANCE BRIDGE
BAL
BRIDGE POWER
RADIO SET CONTROL
C-451A/ARC-21
K604
0.22
+27.5V
K605
150
270
FRICTION CLUTCH
B605
SELECTOR MOTOR
TO B606, B607, B608
S604
BAND SWITCH
J1205
S501
S504
K606
K502
K503
TO POWER AMPLIFIER
FOR FIXED
CAPACITORS
B502
BAND SWITCH
MOTOR
+27.5V
CYCLE POWER
K1201
+27V
TIMER
B1201
42 SEC
30 SEC
K317
TRANSMITTER
27.5V
RADIO FREQUENCY CHOKE
START CYCLE
TAKE CONTROL
K1102
K1101
TRIP
MASTER POWER
K1704
27.5V
S1305
CONTROL
60°
ON
RADIO SET CONTROL
C-451A/ARC
S1309
TRIP
DOOR
S1302
27.5V

Figure 4-4. Simplified Schematic, Receiver Tuning Radio Set AN/ARC-21


MAXIMUM CAPACITY LIMIT SWITCH S405
E
1
2
J302 P402
C432 0.1
CLUTCH COIL 0405
R419 47
LOAD MOTOR B403
M
R422 5
R425 8
S411B
3
8
3
1
S411C FRONT
R421 5
D
W
C
J302 P402
TUNING MOTOR
5
1
K301
2
4
TUNING MOTOR SCAN K311
1
2
5
4
TUNING MOTOR
K310
2
1
120V SUPPLY
KK
J302 P402
5
4
A
J302 P402
K405
5
1
R415 22K
K404
1
B
27.5V
5
P401 J1204
2
4
3
C418 2
R426 4700
4
3
8
7
C420 0.1
BRAKE 0401
R413 100
P401 J1204
E
+120V

4-6. Simplified Schematic, Transmitter Homing

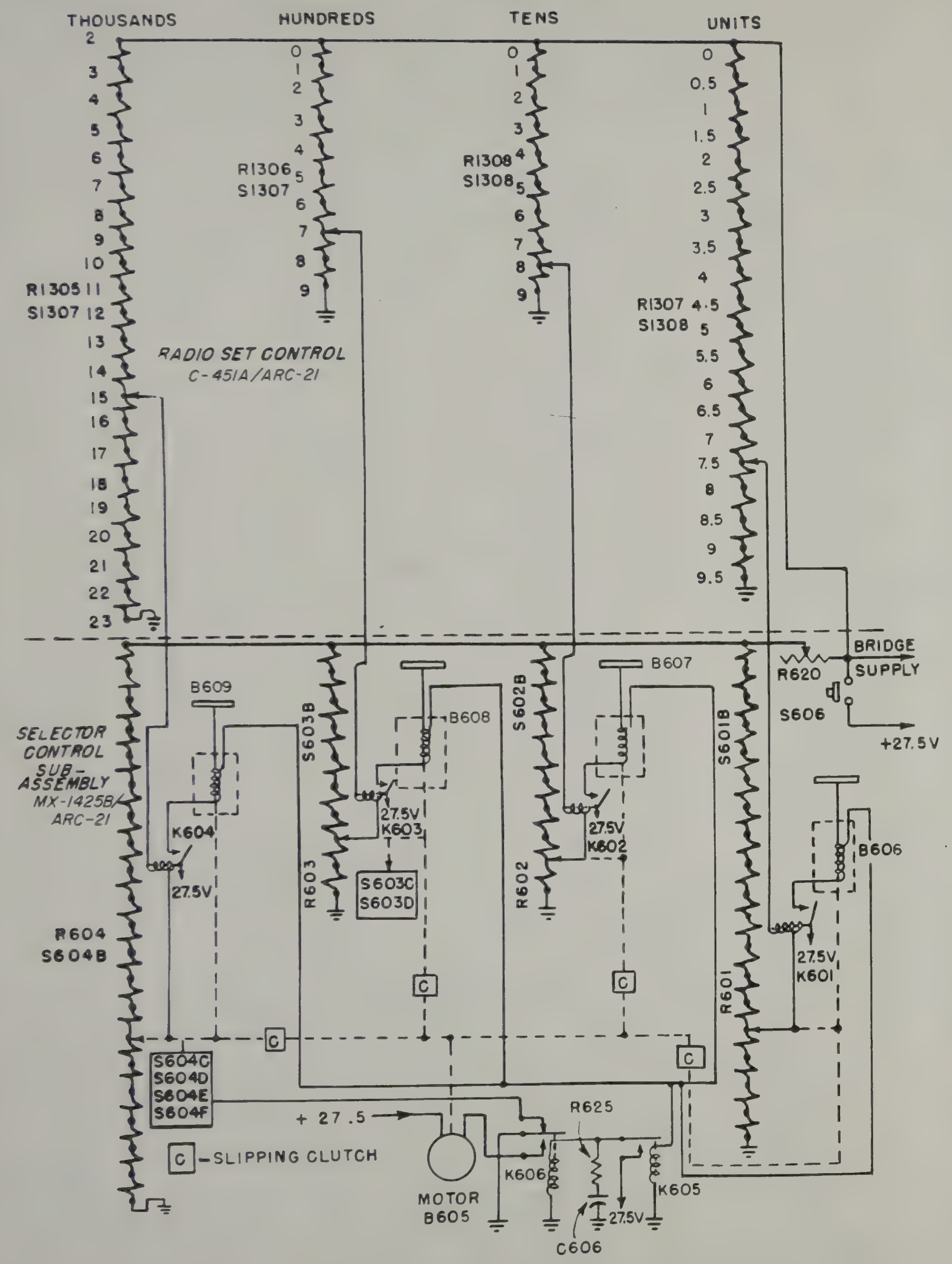
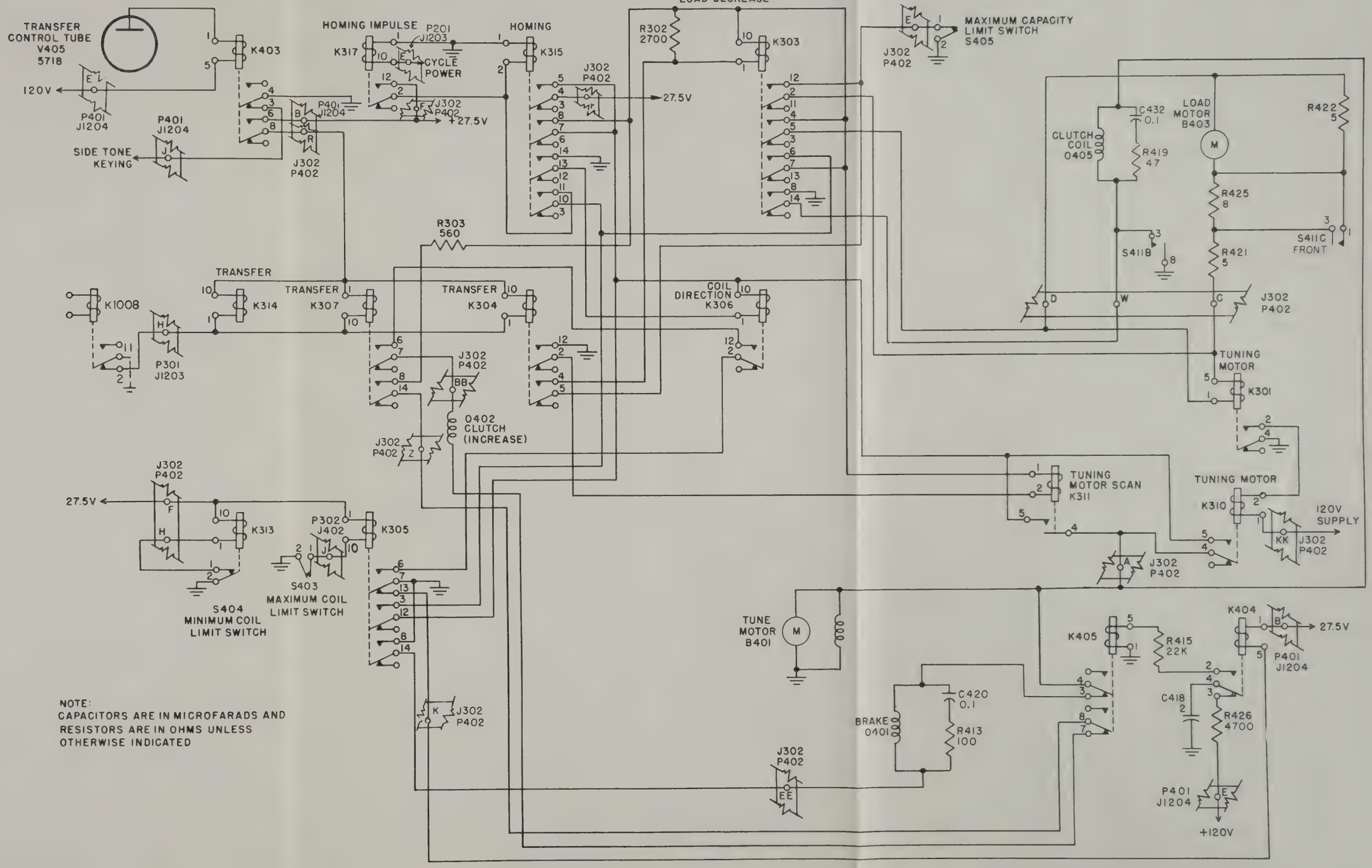
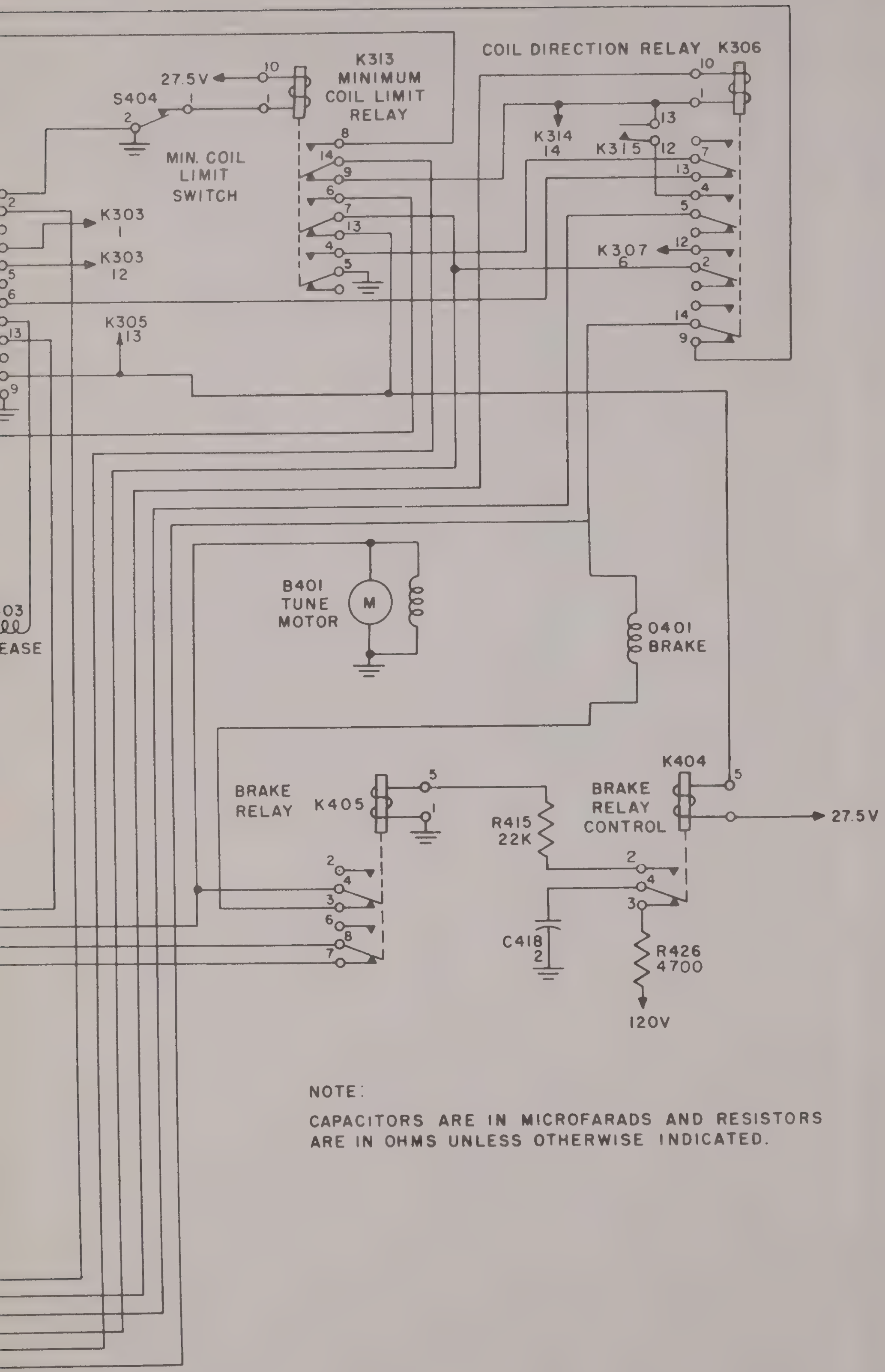

THOUSANDS
HUNDREDS
TENS
UNITS
2
3
4
5
6
7
8
9
10
R1305 11
S1307 12
13
14
15
16
17
18
19
20
21
22
23
0
1
2
3
4
R1306 5
S1307 6
7
8
9
R1308
S1308
0
1
2
3
4
5
6
7
8
9
0
0.5
1
1.5
2
2.5
3
3.5
4
R1307 4.5
S1308 5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
RADIO SET CONTROL
C-451A/ARC-21
BRIDGE
SUPPLY
R620
S606
+27.5V
SELECTOR
CONTROL
SUB-
ASSEMBLY
MX-1425B/
ARC-21
B609
K604
27.5V
R604
S604B
S603B
R603
B608
27.5V
K603
S603C
S603D
S602B
R602
B607
27.5V
K602
S601B
R601
B606
27.5V
K601
C
S604C
S604D
S604E
S604F
C –SLIPPING CLUTCH
+ 27.5
MOTOR
B605
R625
K606
K605
27.5V
C606

Figure 4-5. Simplified Schematic, Frequency Selection


TRANSFER CONTROL TUBE V405 5718
120V
P401 J1204
K403
SIDE TONE KEYING
P401 J1204
J302 P402
HOMING IMPULSE
K317
P201 J1203
CYCLE POWER
P401 J1204
J302 P402
+27.5V
HOMING
K315
J302 P402
27.5V
LOAD DECREASE
R302 2700
K303
MAXIMUM CAPACITY LIMIT SWITCH S405
J302 P402
R303 560
TRANSFER
K1008
K314
P301 J1203
TRANSFER
K307
TRANSFER
K304
COIL DIRECTION K306
J302 P402
0402 CLUTCH (INCREASE)
J302 P402
CLUTCH COIL 0405
C432 0.1
R419 47
LOAD MOTOR B403
R422 5
R425 8
R421 5
S411B
S411C FRONT
J302 P402
TUNING MOTOR
K301
TUNING MOTOR SCAN K311
TUNING MOTOR
K310
120V SUPPLY
J302 P402
J302 P402
27.5V
J302 P402
K313
P302 J402
K305
S403 MAXIMUM COIL LIMIT SWITCH
S404 MINIMUM COIL LIMIT SWITCH
J302 P402
TUNE MOTOR B401
K405
R415 22K
K404
27.5V
P401 J1204
C418 2
R426 4700
BRAKE 0401
C420 0.1
R413 100
J302 P402
P401 J1204
+120V

NOTE:
CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS UNLESS OTHERWISE INDICATED

Figure 4-6. Simplified Schematic, Transmitter Homing


COIL DIRECTION RELAY K306
K313
MINIMUM
COIL LIMIT
RELAY
27.5V
S404
MIN. COIL
LIMIT
SWITCH
K314
14
K315
12
13
K303
1
K303
12
K307
6
K305
13
03
EASE
B401
TUNE
MOTOR
M
O401
BRAKE
K404
BRAKE
RELAY
CONTROL
27.5V
BRAKE
RELAY
K405
R415
22K
C418
2
R426
4700
120V

NOTE:

CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS UNLESS OTHERWISE INDICATED.

4-70. When there is no power amplifier output, plate current will flow in tube V405 to energize relay K403 in its plate circuit. Relay K403 thus energizes the transfer relays K304, K307, and K314. Relay K303 is energized since relay K304 is energized and, with the maximum capacity limit switch S405 closed, locks in relay K315.

4-71. The tuning motor, B401, now runs since it has a complete circuit through relays K311 and K315. The circuit for the clutch, O402, is completed from the 27.5-volt source at relay K315 through transfer relay K307, coil brake relay K405 to the clutch, back through the transfer relay K307 and through the coil direction relay K306 and relay K305 to ground.

4-72. The brake O401 is energized, thereby releasing it, permitting the tuning coil L403 to turn. Homing now starts since the motor is turning, the brake is released and the clutch is engaged. When the home position (maximum inductance) is reached, the limit switch S403 is opened, removing the ground from relay K305, thereby de-energizing it.

4-73. De-energizing relay K305 removes the ground from clutch O402, disengaging it. The ground is also removed from the brake winding, O401, applying the brake to the coil L403. The motor B401 continues to run until the loading capacitor is home, breaking the holding circuit in relay K315.

4-74. During the same time the coil is homing with relay K317,K315,K303 and the transfer relays energized, the loading capacitor will start its homing cycle. Relay K303 was energized by relay K315 and, in addition, is controlled by the maximum capacity limit switch S405. Relay K303 completes the capacitor drive motor circuit so the motor, B403, can now run. Relay K303 also energizes the tuning motor relay, K310, through relay K301. Relay K303 also completes the clutch (O405) circuit. The clutch return circuit is through relay K303.

4-75. The load capacitor will now go home at the full speed of 10 revolutions per minute if the frequency set up is above 5 megacycles. If the frequency is below 5 megacycles, a resistor R425 is inserted in series with the load capacitor to slow the speed of the load capacitor C430 to about 5 revolutions per minute. This speed change is accomplished by switch S411C driven by ratchet motor B402, whose setting is controlled by switch S604 in the Selector Control Sub-assembly MX-1425A/ARC-21. When the loading capacitor C430 reaches the home position, it opens the maximum capacity limit switch S405, de-energizing relay K303. Clutch and motor circuits are now broken since relays K315 and K303 are de-energized.

4-76. SCANNING. (See figure 4-7.) In this description either Power Supply PP-1831/ARC or Power Supply PP-298/ARC-21 is used. Pressing the microphone "push-to-talk" button energizes the high-voltage control relay K4704 or K1705 in the respective power supply, closes the keying relay K411 and the voltage source relay K312. This latter relay places 27.5 volts on the bus for the various relays. Since the high-voltage control relay obtains its power through contacts on relay K315, the power unit cannot be accidentally started during the homing cycles. Relay K411, in closing, will apply screen voltage to the push-push doubler tubes, V512 and V513, plate and screen voltages on the balanced modulator tubes, V508 and V509, and the 1st and 2nd amplifiers V510 and V511 in Amplifier-Oscillator AM-776A/ARC-21. Relay K411 also disables the receiver and turns on the 1000 kilocycle signal.

4-77. The push-push doubler tubes, V512 and V513. will now supply grid drive to the power amplifier tubes, V401 and V402. When grid current flows in the power amplifier tubes, relay K318 closes and energizes relay K319 by completing its ground circuit. The closing of relay K319 is delayed by capacitor C303 connected across the coil. Relay K319 in turn closes relay K309.

4-78. Since there is no r-f output in the final amplifier to cut off the transfer control amplifier tube V405, relay K403 is energized. This relay energizes the transfer relays K304, K307, and K314. The tune motor scan relay, K311, is now energized from the 27.5-volt source through relays K312, K315, K309, K308, and K304 to ground. Tuning motor B401 now starts to run.

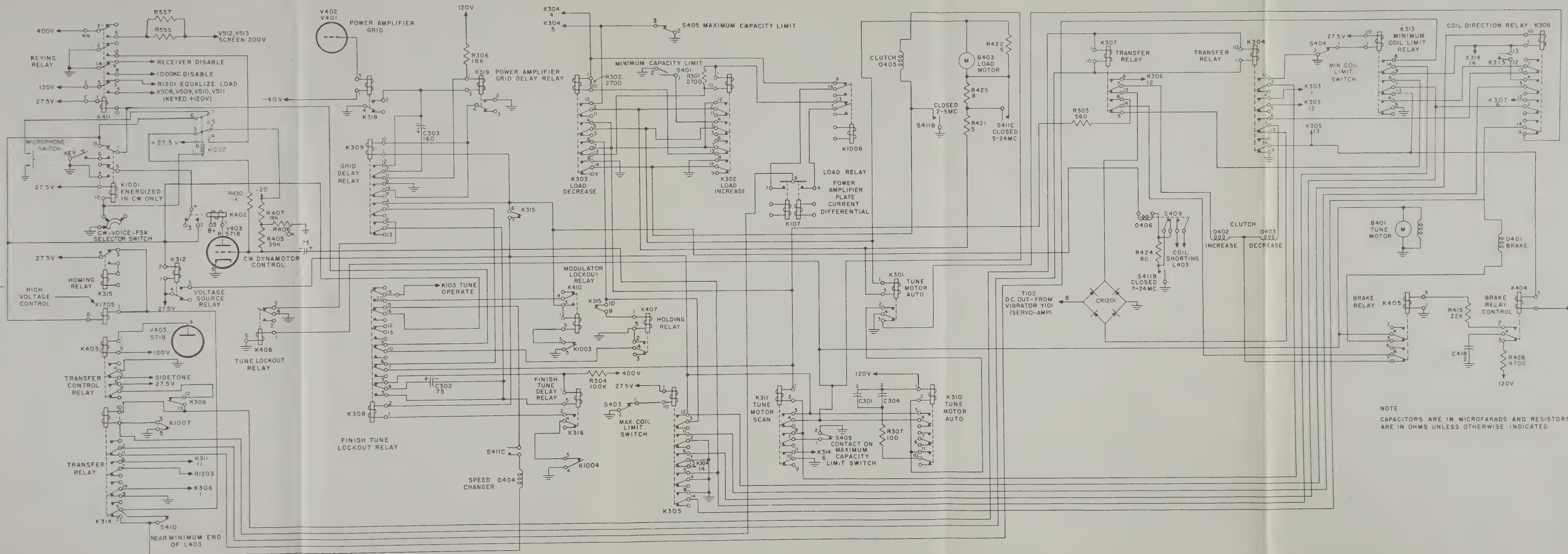
4-79. Before the coil L403 can move for tuning, the clutch O403 and brake O401 must be energized. Clutch O403 is energized through the brake and transfer relays K405 and K307 and relays K308, K309, K315 and K312 to the 27.5-volt supply. The connection from the clutch to ground is completed through relays K304, K306, and K313. Relay K313 is energized through the minimum coil limit switch S404 since the coil is not at the minimum inductance position.

4-80. Brake O401 is energized by grounding one side of the coil through the coil direction relay K306 and the tune motor, auto relay K301. The 27.5-volt side of the brake circuit is completed through the brake relay, K405, and the tune motor scan relay K311.

4-81. Coil L403 will now turn and go toward the minimum inductance position. As the coil leaves home the maximum coil limit switch will close and energize relays K305 and K407. The key or microphone "push-to-talk" button may be released and the power amplifier will complete its tuning cycle due to the action of relay K407. Relays K407, K308, K315, and K305 complete the holding circuit.

4-82. As coil L403 approaches resonance the output is rectified by the transfer diode V404. When this rectified output reaches a predetermined amplitude it cuts off tube V405. The amount of rf necessary to cut off tube V405 is determined by the threshold bias adjustment. Relay K403, in the plate circuit of tube V405, is released when the rectifier carrier voltage reaches an amplitude greater than that of the threshold bias setting. Release of relay K403 removes the 27.5-volt supply from the transfer relays K304, K307, and K314. Adjustments of the threshold bias level, for high- and low-power operation, is made with potentiometers R105 and R106 in the Amplifier, Audio Frequency AM-773A/ARC-21 so the tuning will not respond to spurious tank voltages.

4-83. During the tuning periods some provision is required to prevent excessive plate dissipation in the


400V
R557
R555
V512, V513
SCREEN 200V
KEYING RELAY
RECEIVER DISABLE
1000KC DISABLE
R1201 EQUALIZE LOAD
V508, V509, V510, V511
(KEYED +120V)
120V
27.5V
K411
MICROPHONE SWITCH
KEY
+27.5 V
K1202
27.5V
K1001
ENERGIZED IN CW ONLY
CW-VOICE-FSK SELECTOR SWITCH
R430 1K
-20
K402
R407 18K
R406 10K
R405 39K
V403 5718
CW DYNAMOTOR CONTROL
27.5V
HOMING RELAY
K315
HIGH VOLTAGE CONTROL
K1705
K312
VOLTAGE SOURCE RELAY
27.5V
V405 5718
K403
120V
TRANSFER CONTROL RELAY
SIDETONE
27.5V
K308
K1007
TRANSFER RELAY
K311 11
R1203
K306 1
K314
S410
NEAR MINIMUM END OF L403
V402 V401
POWER AMPLIFIER GRID
-40V
K318
120V
R306 18K
K319 POWER AMPLIFIER GRID DELAY RELAY
C303 160
K309
GRID DELAY RELAY
K315
TUNE LOCKOUT RELAY
K406
K103 TUNE OPERATE
C302 75
K308
FINISH TUNE LOCKOUT RELAY
K304 4
K304 5
S405 MAXIMUM CAPACITY LIMIT
MINIMUM CAPACITY LIMIT
S401
R302 2700
R301 2700
K303 LOAD DECREASE
K302 LOAD INCREASE
MODULATOR LOCKOUT RELAY
K410
K315
K407
HOLDING RELAY
K1003
FINISH TUNE DELAY RELAY
R304 100K
400V
27.5V
S403
MAX. COIL LIMIT SWITCH
K316
S411C
SPEED CHANGER 0404
K1004
K305
K304 14
K1008
LOAD RELAY
POWER AMPLIFIER PLATE CURRENT DIFFERENTIAL
K107
120V
C301
C304
K311 TUNE MOTOR SCAN
K310 TUNE MOTOR AUTO
R307 100
S405 CONTACT ON MAXIMUM CAPACITY LIMIT SWITCH
K314 6
K301 TUNE MOTOR AUTO
CLUTCH 0405
B403 LOAD MOTOR
R422 5
R425 8
R421 5
CLOSED 2-5MC
S411B
S411C CLOSED 5-24MC
K307 TRANSFER RELAY
K306 12
R303 560
0406
S409
R424 80
COIL SHORTING L403
S411B CLOSED 7-24MC
T102 D.C. OUT-FROM VIBRATOR Y101 (SERVO-AMP)
CR1201
CLUTCH
0402 INCREASE
0403 DECREASE
TRANSFER RELAY
K304
K303 1
K303 12
K305 13
S404
27.5V
MIN COIL LIMIT SWITCH
K313 MINIMUM COIL LIMIT RELAY
COIL DIRECTION RELAY K306
K314 14
K315 12
K307 6
B401 TUNE MOTOR
0401 BRAKE
BRAKE RELAY K405
R415 22K
C418 2
R426 4700
120V
BRAKE RELAY CONTROL
K404
27.5V

NOTE:
CAPACITORS ARE IN MICROFARADS AND RESISTORS ARE IN OHMS UNLESS OTHERWISE INDICATED

Figure 4-7. Simplified Schematic, Transmitter Tuning

4-70. When there is no power amplifier output, plate current will flow in tube V405 to energize relay K403 in its plate circuit. Relay K403 thus energizes the transfer relays K304, K307, and K314. Relay K303 is energized since relay K304 is energized and, with the maximum capacity limit switch S405 closed, locks in relay K315.

4-71. The tuning motor, B401, now runs since it has a complete circuit through relays K311 and K315. The circuit for the clutch, O402, is completed from the 27.5-volt source at relay K315 through transfer relay K307, coil brake relay K405 to the clutch, back through the transfer relay K307 and through the coil direction relay K306 and relay K305 to ground.

4-72. The brake O401 is energized, thereby releasing it, permitting the tuning coil L403 to turn. Homing now starts since the motor is turning, the brake is released and the clutch is engaged. When the home position (maximum inductance) is reached, the limit switch S403 is opened, removing the ground from relay K305, thereby de-energizing it.

4-73. De-energizing relay K305 removes the ground from clutch O402, disengaging it. The ground is also removed from the brake winding, O401, applying the brake to the coil L403. The motor B401 continues to run until the loading capacitor is home, breaking the holding circuit in relay K315.

4-74. During the same time the coil is homing with relay K317,K315,K303 and the transfer relays energized, the loading capacitor will start its homing cycle. Relay K303 was energized by relay K315 and, in addition, is controlled by the maximum capacity limit switch S405. Relay K303 completes the capacitor drive motor circuit so the motor, B403, can now run. Relay K303 also energizes the tuning motor relay, K310, through relay K301. Relay K303 also completes the clutch (O405) circuit. The clutch return circuit is through relay K303.

4-75. The load capacitor will now go home at the full speed of 10 revolutions per minute if the frequency set up is above 5 megacycles. If the frequency is below 5 megacycles, a resistor R425 is inserted in series with the load capacitor to slow the speed of the load capacitor C430 to about 5 revolutions per minute. This speed change is accomplished by switch S411C driven by ratchet motor B402, whose setting is controlled by switch S604 in the Selector Control Sub-assembly MX-1425A/ARC-21. When the loading capacitor C430 reaches the home position, it opens the maximum capacity limit switch S405, de-energizing relay K303. Clutch and motor circuits are now broken since relays K315 and K303 are de-energized.

4-76. SCANNING. (See figure 4-7.) In this description either Power Supply PP-1831/ARC or Power Supply PP-298/ARC-21 is used. Pressing the microphone "push-to-talk" button energizes the high-voltage control relay K4704 or K1705 in the respective power supply, closes the keying relay K411 and the voltage source relay K312. This latter relay places 27.5 volts on the bus for the various relays. Since the high-voltage control relay obtains its power through contacts on relay K315, the power unit cannot be accidentally started during the homing cycles. Relay K411, in closing, will apply screen voltage to the push-push doubler tubes, V512 and V513, plate and screen voltages on the balanced modulator tubes, V508 and V509, and the 1st and 2nd amplifiers V510 and V511 in Amplifier-Oscillator AM-776A/ARC-21. Relay K411 also disables the receiver and turns on the 1000 kilocycle signal.

4-77. The push-push doubler tubes, V512 and V513. will now supply grid drive to the power amplifier tubes, V401 and V402. When grid current flows in the power amplifier tubes, relay K318 closes and energizes relay K319 by completing its ground circuit. The closing of relay K319 is delayed by capacitor C303 connected across the coil. Relay K319 in turn closes relay K309.

4-78. Since there is no r-f output in the final amplifier to cut off the transfer control amplifier tube V405, relay K403 is energized. This relay energizes the transfer relays K304, K307, and K314. The tune motor scan relay, K311, is now energized from the 27.5-volt source through relays K312, K315, K309, K308, and K304 to ground. Tuning motor B401 now starts to run.

4-79. Before the coil L403 can move for tuning, the clutch O403 and brake O401 must be energized. Clutch O403 is energized through the brake and transfer relays K405 and K307 and relays K308, K309, K315 and K312 to the 27.5-volt supply. The connection from the clutch to ground is completed through relays K304, K306, and K313. Relay K313 is energized through the minimum coil limit switch S404 since the coil is not at the minimum inductance position.

4-80. Brake O401 is energized by grounding one side of the coil through the coil direction relay K306 and the tune motor, auto relay K301. The 27.5-volt side of the brake circuit is completed through the brake relay, K405, and the tune motor scan relay K311.

4-81. Coil L403 will now turn and go toward the minimum inductance position. As the coil leaves home the maximum coil limit switch will close and energize relays K305 and K407. The key or microphone "push-to-talk" button may be released and the power amplifier will complete its tuning cycle due to the action of relay K407. Relays K407, K308, K315, and K305 complete the holding circuit.

4-82. As coil L403 approaches resonance the output is rectified by the transfer diode V404. When this rectified output reaches a predetermined amplitude it cuts off tube V405. The amount of rf necessary to cut off tube V405 is determined by the threshold bias adjustment. Relay K403, in the plate circuit of tube V405, is released when the rectifier carrier voltage reaches an amplitude greater than that of the threshold bias setting. Release of relay K403 removes the 27.5-volt supply from the transfer relays K304, K307, and K314. Adjustments of the threshold bias level, for high- and low-power operation, is made with potentiometers R105 and R106 in the Amplifier, Audio Frequency AM-773A/ARC-21 so the tuning will not respond to spurious tank voltages.

4-83. During the tuning periods some provision is required to prevent excessive plate dissipation in the power amplifier tubes V401 and V402. Resistor R1203 is connected from the screen grids of the power amplifier tubes to ground through relays K311 and K314 to reduce the voltage during tuning periods.

4-84. TUNING: FROM TWO TO FIVE-MEGACYCLES. When the tuning coil L403 approaches resonance during its scanning, the phase detector V514 takes control and feeds its output signal into the servo amplifier. The operation of the phase detector is such that a d-c voltage is produced if the r-f grid and plate voltages of the amplifier are not displaced by 180 degrees, a condition which must exist at resonance. The polarity of this voltage will depend on whether the plate circuit is tuned above or below the frequency in the grid circuit. The servo amplifier is the amplifier section of the Amplifier, Audio Frequency AM-773A/ARC-21 except the clipper tube V101 and modulator tubes V105 and V106. A self-rectifying vibrator, Y101, chops the input and rectifies the output to amplify the d-c output of the phase detector. Resistors R136 and R137 and capacitor C118 form a rate network which prevents coil L403 from hunting (oscillating mechanically).

4-85. The servo amplifier, having the characteristics of a d-c amplifier, changes its output polarity and amplitude in accordance with the output of the phase detector, V514. Polarity throughout the control system must be maintained, otherwise, the coil will be driven away from rather than toward, the resonant point. Tubes V102, V103, V104, and V109, in the Amplifier, Audio Frequency AM-773A/ARC-21 are used as the servo amplifier.

4-86. The direction of coil rotation is controlled by clutches O402 and O403. These clutches are controlled by the phase detector through the servo amplifier. To select the proper clutch, selenium rectifiers CR1201A, CR1201B, CR1201C, and CR1201D limit the current direction so that one clutch will be energized on positive-phased discriminator output and the other clutch will be energized on negative output.

4-87. The common lead for both clutches is completed through relays K405, K307, K313, and K305. The remaining side of the circuit is completed by relay K304 for clutch O403 and by relay K307 for clutch O402.

4-88. At the time of transfer to servo control, brake O401 is applied for a fraction of a second to slow down the coil momentarily. This prevents the coil from passing through resonance while the transfer is being made. The brake is applied by discharging capacitor C418 through relay K405 and a 22,000-ohm series resistor, R415. Both the clutches and the brake are de-energized by relay K405. The scanning period is completed when the resonance position is found.

4-89. LOADING. During the scanning period, the loading motor, B403, was kept de-energized by relays K303 and K314. Once resonance has been established, motor B403 starts to turn. The motor receives its intelligence from a polarized relay, K107, in the Amplifier, Radio Frequency AM-773A/ARC-21. The circuit is completed through relays K1008, K302, and K303. Operation of relay K302 decreases the capacity of loading capacitor C430 while relay K303 causes it to increase. Reversal of motor B403 is accomplished by changing the polarity of the supply leads, since the motor has a permanent magnet field.

4-90. The loading circuit now takes over control of the tuning motor, B401, through relays K301 and K310. To prevent a premature shut-down of the tuning operation, should the plate current swing through the normal operating range while loading is still in progress, capacitors C301 and C304 delay the opening of relay K310.

4-91. When tuning reaches a point where the power amplifier plate current is correct and the phase is satisfactory, relay K107, in the Amplifier, Audio Frequency AM-773A/ARC-21 chassis, will be in neutral position. Relay K107 is a double-coil, polarized relay with the plate current of tubes V401 and V402 flowing through one winding and a fixed current through the other. The two currents create magnetic fields which are in opposition to each other. When the power amplifier plate current is 220 milliamperes for high power or 70 milliamperes for low power, the armature of the relay will move to a neutral and open both contacts. This de-energizes relays K301, K302, K303 and K310. Tuning motor B401 and relay K406 are de-energized and relay K316 is energized. Relay K316 closes relay K308, the final lockout for all tuning and loading circuits. In order to give the system a short time to stabilize before relay K308 closes, capacitor C302 is used to delay the closing of relay K316.

4-92. When the tuning lockout relay K308 closes, relays K410 and K103 are energized in sequence, setting up the transmitter circuits for modulation. In addition, relay K308 de-energizes the tuning lock relay K407 so the transmitter switches to "standby" operation if the microphone "push-to-talk" button is not depressed. Relay K1003, in the Relay Assembly RE-135B/ARC-21, delays the closing of relay K103 in the modulator unit until the ERA Coupler cycle is completed.

4-93. On completion of the ERA Coupler tuning, the equipment will be ready for operation under both receiving and transmitting conditions. On succeeding transmissions it is necessary to delay the start of tuning for a fraction of a second. This permits the dynamotors in the power supply to come up to normal output and the power amplifier and modulator tubes to heat fully. Relays K309, K318 and K319 accomplish this. Relays K309 and K319 form a slow-make combination, along with capacitor C303, preventing the start of motors B401 and B403 until stabilization of the power amplifier is accomplished.

4-94. The success of this type of automatic tuning depends on the maintenance of proper speed relationships between the power amplifier coil, L403, and loading capacitor C430. In the two-to-five megacycle range, the maximum speed of coil L403 is 750 rpm and that of the loading capacitor is about five rpm.

4-95. In this frequency range, the clutch O405 is continuously energized during the tuning cycle. Clutch O405 and motor B403 need not be actuated simultaneously, because some overtravel of the loading capacitor C430 can be tolerated without hunting, in this frequency range.

4-96. TUNING: FROM FIVE TO 24 MEGACYCLES. The automatic tuning sequence above five megacycles is similar to that just described for the two- to five-megacycle range with the following differences.

4-97. Switch S411C, driven by ratchet motor B402, short cuts resistor R425 to enable motor B403 to drive the loading capacitor, C430, at the full speed of 10 rpm.

4-98. During the scanning part of the tuning cycle the coil L403, rotates at its full speed of approximately 750 rpm. At the time of transfer to phase-detector control, relays K314 and K315 energize the speed changer O404. This reduces the speed of the coil to approximately 150 rpm during the loading phase of the cycle. Should the coil L403 continue to run during scanning until a point about seven turns from minimum inductance is reached, the roller will actuate switch S410 to energize the speed changer O404. This reduces the speed of the coil to approximately 150 rpm.

4-99. At frequencies of seven megacycles and higher, spurious resonance in coil L403 is prevented by applying a short across part of the unused portion by a solenoid-operated switch S409. The actuating solenoid O406, is energized by relay K312 through relay K315 and switch S411B. In addition, the entire unused portion of the coil is shorted from the coil roller to a slip ring connected to the last turn of the coil.

4-100. The r-f choke coil, L402, in the plate circuit of the power amplifier tubes consists of spiral-wound pies with an electrostatic shield between two of them. In order that this coil may function efficiently over the entire operating range, capacitors C439 and C440 are connected across part of the winding by relay K401 in the frequency range of from 9 to 13.995 megacycles. Relay K401 receives its operating voltage from switch S604B, front water in the Selector Control Subassembly MX-1425B/ARC-21.

4-101. TUNING: CW. The cw tuning cycle is similar to that described for voice tuning but differs in that the keying relay K411, takes full control when the telegraph key is pressed. Relay K312 and the transmitter start relay in the power supply unit are indirectly operated by the dynamotor start relay K402.

4-102. A delay circuit, which allows for approximately a four-second break in transmission, is activated by the emission relay K1001 in the Relay Assembly RE-135B/ARC-21. If keying is delayed for more than four seconds the transmitter section of the power will shut down.

4-103. The four-second delay is obtained through the dynamotor delay tube, V403. Capacitor C411 is discharged when the key is pressed, since the negative side of the capacitor is grounded through a contact on the keying relay K411. The dynamotor delay tube V403 will conduct at zero or positive grid voltages, closing relay K402. When the keying relay opens, capacitor C411 charges through resistors R405 and R407. The negative voltage to cut off tube V403 is supplied by the receiver and is applied to the junction of resistors R405 and R406. Relay K402 is released when the plate current of tube V403 reaches a predetermined point.

4-104. The r-f signal is non-existent unless the telegraph key is depressed. This is accomplished by contacts on relay K411 which remove the screen voltage from the exciter tubes V512 and V513, remove the plate and screen voltages from the balanced modulators V508 and V509 and the amplifier tubes V510 and V511. The 900-kilocycle signal is also removed from the balanced modulators.

4-105. In order to protect the power amplifier tubes when the key is released, relay K4702, K1703 or K1603 in Power Supply PP-1831/ARC, Power Supply PP-298/ARC-21 or Dynamotor Assembly DY-50/ARC-21, respectively inserts a resistor, R4701, R1701 or R1603 in series with the negative lead of the transmitter supply to reduce the plate and screen voltages.

4-106. TUNING: FREQUENCY SHIFT KEYING. The frequency shift keying tuning cycle is similar to that for voice transmission. There are two important differences: The modulator is disabled at the end of the tuning cycle and the microphone "push-to-talk" circuit is replaced by the receiver-transmit switch on the teletypewriter.

4-107. ERA COUPLER.

4-108. GENERAL. The coupler contains all the r-f circuit elements required to achieve the desired impedance match between the antenna and the power amplifier of the transmitter. Fixed wire aircraft antennas have a wide range of impedance over the operating frequency range of the equipment. The coupler reduces this variation in antenna impedance to an impedance level approximately within a two-to-one standing-wave ratio circle around 52 ohms. In addition, the associated d-c circuitry provides the automatic tuning functions of coupler and transmitter as necessary.

4-109. HOMING. Homing is initiated whenever the equipment is turned on or the channel is changed. This is required to position the proper fixed elements and to drive the variable capacitor in the ERA Coupler to minimum capacity. When cycle power is applied for receiver tuning and transmitter homing, relay K317 is energized. Contacts 6 and 7 close on relay K317 applying 27.5 volts to the cable load relay thus energizing relays in the ERA Coupler which terminate the transmitter output in a 52-ohm dummy load for the transmitter tuning sequence.

4-110. Relay K317, in closing, also applies 27.5 volts to relay K1003 in Relay Assembly RE-135B/ARC-21, energizing it and locking it in. The holding circuit is through contacts 7 and 8 of relay K1004 to the relay supply source. Closing relay K1003 removes the ground from contact 3 of relay K1003. This action removes the ground from the tune-operate lockout of the transmitter. Ground is also applied through contact 6 of relay K1003, placing the transmitter in low power.

4-111. COUPLER-TRANSMITTER SEQUENCE. This sequence is initiated by depressing the key or pressing the "push-to-talk" button, after which the transmitter tunes up in low power. Tuning proceeds in normal fashion in low power into the 52-ohm load resistor connected across a transmitter output. The load resistor is mounted in the ERA Coupler, and is switched into and out of the circuit as required. Relay K1003 keeps the transmitter in low power during the coupler-transmitter sequence and the coupler tuning sequence.

4-112. On depressing the key or "push-to-talk" button relays are energized which transfer the antenna from the receiver to the coupler, remove the cut-off bias from the low-level transmitter exciter stages, and energizes Relay, Solenoid RE-132/ARC if so required. These have about one second delay in opening after keying stops, making it unnecessary for Relay, Solenoid RE-132/ARC if so required. These have about one second delay, Solenoid RE-132/ARC to follow the keying.

4-113. COUPLER TUNING SEQUENCE. On completion of the transmitter tuning cycle, relay K308 in Relay Assembly RE-136A/ARC-21 is energized, in turn energizing relay K1008 in Relay Assembly RE-135B/ARC-21. Relay K1008 deactivates the transmitter load motor and receiver-transmitter relays, and removes ground from coupler circuits which cause switch-over from the 52-ohm dummy load to the antenna and initiate coupler tuning.

4-114. When coupler tuning begins, ground is applied to the coil of relay K1005, which charges capacitor C1001 and grounds the coupler keying lead so that the coupler tuning cycle cannot be interrupted. On completing coupler tuning relay K1005 is de-energized, restoring the keying function to the key or microphone "push-to-talk" button and discharging capacitor C1001 through the coil of the high-resistance relay K1004.

4-115. This discharge momentarily energizes relay K1004 which, in turn, initiates the differential returning cycle in the Relay Assembly RE-136A/ARC-21 by momentarily energizing relay K310. Relay K1004 also de-energizes relay K1003, which is the final operation in the coupler tuning sequence. When relay K1003 is de-energized, it in turn, grounds relay K1009. This enables the retune lock-out circuit.

4-116. TRANSMITTER DIFFERENTIAL RETUNE. This sequence is initiated by the momentary closing of relay K1004 in the Relay Assembly RE-135B/ARC-21. The sequence is to permit the transmitter to match the impedance of the load now presented, since it differs from the impedance of the load resistor into which the transmitter previously tuned. The Amplifier, Radio Frequency AM-774A/ARC-21 will now tune to match the impedance presented at the transmitter end of the coaxial cable to the plate impedance of the power amplifier tubes.

4-117. The momentary closing of relay K1004 initiates this differential retune cycle in Amplifier, Radio Frequency AM-774A/ARC-21 by momentarily de-energizing relay K308 and momentarily energizing relay K310. This operation activates both the phase detector and current comparator circuits in the Amplifier, Radio Frequency AM-774A/ARC-21. The power amplifier matching network can now properly match the impedance presented to it, by the coaxial cable between the power amplifier and the coupler, to the plate impedance of the power amplifier output tubes.

4-118. RETUNE LOCKOUT. On completion of differential retune, K1009 operates, the circuit being completed to ground through contacts 3 and 7 of relay K1003. Contacts 5 and 6 of relay K1009 ground the coil of relay K1008, so that the relay remains operated regardless of the position of relay K308. This feature prevents the transmitter from again going into differential retune.

4-119. STARTING RELAY SEQUENCE.

4-120. The starting relay sequence is broken down under several headings relating to the particular functions performed. The different sequences are at times interrelated and overlap as to time of operation. To compare the operational times see figure 4-3 for the relative time periods for the different functions.

4-121. INITIAL STARTING SEQUENCE. This sequence is written for equipment using Power Supply PP-298/ARC-21X but indicates the difference due to using Dynamotor Assembly DY-50/ARC-21.

4-122. "CONTROL" switch S1305 in Control, Radio Set C-451A/ARC-21 is turned to "ON."

4-123. Master power relay K1704 in the power supply applies 27.5 volts dc to motors and relay circuits; and 115 volts to filament transformer T1702 and the heater of the delay relay K1702. The 27.5 volts energize the master trip relay K1101 in Chassis, Receiver-Transmitter MX-1424A/ARC-21 which, in turn, trips the "CONTROL" on all other controls. The take control relay, K1102, closes momentarily, from actuation, at the 30-degree position of the "CONTROL" switch.

4-124. Take control relay K1102 applies the starting cycle pulse which initiates the receiver tuning relay sequence (described later). Further rotation of the "CONTROL" knob toward the "ON" position (60-degree) opens the take control relay K1102. Relay K1102 is released slowly due to the charge on capacitor C1101 connected across the relay coil.

4-125. Delay relay K1702 closes after rectifier tube warm-up of approximately 15 seconds. This relay closes relay K1701 which applies the 140-volt plate supply. When relay K1701 is energized, the ground to relay K1702 is removed allowing relay K1702 to cool off thus returning to its normally open position. Relay K1701 remains energized and is only de-energized when the "CONTROL" is turned to "OFF." Since no delay relay is included in the Dynamotor Assembly DY-50/ARC-21, this step is not used with this power supply.

4-126. The receiver tuning sequence is now held where the band switch motor B502 in Amplifier-Oscillator AM-776A/ARC-21 sets the band and releases relay K502, until the timing motor B1201 makes its 30-second contact closing. This contact closing locks up auxiliary timer relay K1201, completing the receiver tuning sequence circuit to relay K504. The receiver tuning completes the remainder of its cycle.

4-127. TIMING MOTOR, B1201, SEQUENCE. The timing motor provides two separate time periods; the first is approximately 30 seconds for the initial warm-up and the second is 10 to 12 seconds later.

4-128. The timing motor B1201 has 27.5 volts applied to it when the power amplifier relay K317 in Relay Assembly RE-136A/ARC-21 is closed by the start cycle voltage. The start cycle voltage is turned on during the first step of the receiver tuning relay sequence.

4-129. The timing motor closes one set of contacts after the initial 30-second warm-up permitting the receiver tuning to continue.

4-130. When the receiver tuning cycle is completed the power amplifier relay K317 switches timing motor B1201 in preparation for timing the transmitter and coupler tuning cycle.

4-131. If the initial receiver tuning cycle is not completed within the normal timing period (approximately 10 to 12 seconds), the timing motor closes the second set of contacts (after a total elapsed time of 40 to 42 seconds), pulsing the take control relay K1102 and tripping the "CONTROL" switch S1305 to the "OFF" position.

4-132. A new timing cycle must now be started as for the initial start.

NOTE

For other than initial start, the auxiliary timer relay K201 remains locked up (except for a 27.5-volt power interruption) and the receiver tuning sequence is not delayed by 30 seconds. This gives a total timing period of 40 to 42 seconds tuning time on subsequent frequency selections.

4-133. RECEIVER RELAY SEQUENCE.

4-134. CHANGE OF FREQUENCY CHANNEL. The following listing gives the relay sequence occurring after a channel change.

Switch S1309 applies pulse to start cycle (switch S1309 actuated when channel selector is turned).

Relay K203 closes, applying tuning cycle power.

Relay K204 closes, locking in relay K203.

Selector Control Sub-assembly MX-1425A/ARC-21 positions, relay K503 releases. Tuning homes to low-frequency switch S503. Relay K501 closed.

Band switch motor positions, relay K502 releases.

Relay K504 operates and locks up. Relay K202 closes and relay K501 opens.

Tuning motor, B501, scans at high speed. Clutch O501 and relays K202 and K205 in Relay Assembly RE-134A/ARC-21 energized.

During the high-speed scan the positive (V_n) signal, at the tuning point, from the 500-kilocycle tuned discriminator in the Amplifier Filter Assembly AM-775A/ARC-21, triggers the thyratron V201.

Thyratron V201 conducts, closing K201. Clutch O501 is released. Slow-speed reverse starts.

On passing the tuning point the phase discriminator output voltage (V_d) is decreased, biasing off tube V202. This releases relays K202 and K205 and closes relays K206 and K501.

Relay K501 reverses tuning motor B501.

As tuning point is approached the tuning center signal (Vd) is of increasing positive polarity, closing relays K202 and K205 in turn. This brakes motor and releases relay K204.

Relay K204 releases K203, turning off cycle power to complete the receiver tuning cycle.

NOTE

If thyratron V201 is fired and no normal tuning control (lock-in) follows, the tuner, moving at slow speed toward the low-frequency position, may run out on the timer. This will turn off the equipment. Otherwise it may close the auxiliary low-frequency limit switch S505 releasing relay K201 and return to high-speed scan.

4-135. TRANSMITTER RELAY SEQUENCE.

4-136. TRANSMITTER HOMING RELAY SEQUENCE ON CHANGE OF FREQUENCY CHANNEL. For each frequency change the homing sequence is initiated.

Pulse applied to start cycle relay from Radio Set Control C-451A/ARC-21 switch S1309 closes relay K317.

Switch S1309 is actuated when channel selector is turned.

Relay K409 in Amplifier Radio Frequency AM-774A/ARC-21 is energized and ratchet motor B402 moves switch S406 to new position.

Relay K317 energizes relays K315, K311, K306 and K303 in Relay Assembly RE-136A/ARC-21. Relays K304, K305, K307, K313, K314 and K403 are already energized by the master power relay K1704 in Power Supply PP-298/ARC-21X.

Coil L403 moves to maximum inductance and capacitor C430 moves to maximum capacity.

Limit switch S403 releases relay K305 and actuates brake O401 through relays K404 and K405.

Limit switch S405 releases relay K303 unlocking relay K315.

Motors B401 and B403 shut down and cycle is completed.

4-137. TRANSMITTER VOICE-TUNING RELAY SEQUENCE. Relays K1001 and K1202 are de-energized by the "CW-SHARP-CW BROAD-VOICE-FSK" switch. This sequence occurs when the microphone "push-to-talk" button is pressed, following the homing sequence.

Relays K312, K411, and K1705 are energized, closing relay K311 and starting power supply unit.

Power amplifier grid current closes relays K318, K319, and K309.

Coil L403 moves toward minimum inductance.

Relay K407 closes after coil roller leaves switch S403, so tuning will continue if microphone "push-to-talk" button is released.

As resonance is approached, relays K403, K304, K307 and K314 are released by the rectified r-f voltage from diode V404.

Relay K306 closes.

Brake K401 is applied momentarily by relays K404 and K405 to slow down coil L403 while the servo amplifier and phase detector assume control.

Relay K302 closes and capacitor moves toward minimum capacity. Relays K301 and K310 close.

Relay K311 is released by switch S405.

Relay K107 in Amplifier, Audio Frequency AM-773A/ARC-21 assumes a neutral position when the setting of capacitor C430 is correct.

Relays K302, K301, and K310 release and motors B401 and B403 shut down.

Relay K406 releases, closing relays K316 and K308.

ERA Coupler tunes.

Relay K1003 in Relay Assembly RE-135B/ARC-21 de-energizes, closing relays K410 and K103.

Relay K103 prepares modulator for operation and transmitter is ready for voice transmission.

4-138. TRANSMITTER CW TUNING RELAY SEQUENCE. Relays K1001 and K1202 are energized by the "CW-SHARP-CW BROAD-VOICE-FSK" switch. This sequence occurs when the key is pressed following the homing sequence.

Relay K411 is energized.

Bias voltage is removed from tube V403 by relay K411, to disable modulator.

Transmitter is now ready for cw transmission.

Relay K1603 in Dynamotor Assembly DY-50/ARC-21 inserts resistor R1603 in series with power supply negative return to protect power amplifier tubes V401 and V402 when key is released.

Approximately four seconds after keying has ceased, relay K402 releases relays K312 and K1705 and transmitter shut-down is complete.

4-139. TRANSMITTER FSK TUNING RELAY SEQUENCE. This sequence occurs when an external "transmit" switch is closed for transmission of frequency shift keying signals.

Operation is the same as for voice operation except relay K208 is energized to disable the modulator.

4-140. ERA COUPLER RELAY SEQUENCE.

4-141. HOMING. Relay K1003 is energized, causing coupler to home.

4-142. TUNING. This sequence is automatically initiated on completion of the transmitter tune sequence.

Relay K1008, connected in parallel with relay K308, disables transmitter tuning, connects antenna to coupler, and initiates coupler tuning.

Relay K1005 is energized during coupler tuning, charging C1001.

Relay K1005 releases when coupler tuning is completed.

Relay K1005 momentarily energizes relay K1004.

Relay K1004 momentarily de-energizes relay K308, momentarily energizes relay K310, and de-energizes relay K1003. Transmitter goes into differential retune.

At end of differential retune, relay K1009 operates and locks.

Relay K1009 energizes relay K1008, disabling transmitter tuning circuits and preventing transmitter from going into differential retune on subsequent operation of key or press-to-talk button.

4-143. TRANSMITTER DIFFERENTIAL RETUNE. The transmitter will retune after completion of the coupler tune sequence to match the coupler input impedance. This operation is initiated by relay K1008 at end of ERA Coupler tuning sequence.

4-144. POWER SUPPLY OUTPUT VOLTAGES AND CURRENTS.

4-145. Three types of power supplies are available, identical in output voltages but differing in the input voltage requirements. The Dynamotor Assembly DY-50/ARC-21 is used when only 27.5-volt dc is available, while the Power Supply PP-298/ARC-21X and Power Supply PP-1831/ARC are used when both 27.5-volt d-c and 115-volt, 380- to 1000-cycle a-c are available.

4-146. RECEIVE.

Receiver plate supply:	140 volts at 0.24 ampere
Receiver bias supply:	-20 volts at 0.002 ampere

Tube heaters, a-c, d-c: 27.5 volts at 4 amperes

Tube heaters, d-c: 27.5 volts at 0.45 ampere

4-147. TRANSMIT, CW OR FREQUENCY SHIFT KEYING.

Receiver plate supply: 140 volts at 0.24 ampere

Receiver bias supply: -20 volts at 0.002 ampere

Tube heaters, a-c, d-c: 27.5 volts at 4 amperes

Tube heaters, d-c: 27.5 volts at 0.45 ampere

Medium plate supply: 400 volts at 0.190 ampere

High plate supply: 1000 volts at 0.300 ampere

Filament supply, 4-65A tubes: 27.5 volts at 3.5 amperes

4-148. TRANSMIT, VOICE.

Same as cw or frequency shift keying except for:

High plate supply: 1000 volts at 0.45 ampere

4-149. RELAY, SOLENOID RE-132/ARC-21.

4-150. The Relay, Solenoid RE-132/ARC-21 is mounted on the aircraft vertical stabilizer to anchor the far end of the fixed-wire antenna. In the body of the assembly is a relay which grounds the antenna at certain predetermined frequencies. The relay energizing voltage comes from the ERA Coupler, when the particular operating frequency demands it.

4-151. SELECTOR CONTROL SUB-ASSEMBLY MX-1425B/ARC-21. (See figures 12-1 and 12-2.)

4-152. Selector Control Sub-assembly MX-1425B/ARC-21 converts frequency information, set up on Radio Set Control C-451A/ARC-21, into usable control frequencies, and sets up various control functions pertaining to frequency control. For simplified schematic diagrams see figure 4-5.

4-153. Included in the unit are four similar bridge-balancing servo selector units, B601, B602, B603, and B604. All the units are driven by motor, B605, through individual slipping clutches. Servo selector units B601 and B604 are 24-position units, and servo selector units B602 and B603 are 12-position units.

4-154. Tapped resistors (R601, R602, R603, and R604), each corresponding to a similar resistor (R1307, R1308, R1306 and R1305) in Radio Set Control C-451A/ARC-21, are mounted on one of the switch wafers driven by each of the servo selector units. These resistors correspond respectively to the units, tens, hundreds, and thousands digits of the operating frequency.

4-155. The selection of a new frequency or control point, starts a new receiver tuning cycle which operates until the sensitive bridge relays K601, K602, K603, and K604, remain open due to rebalancing of the servo bridges by the servo bridge arms and the associated frequency selection switches.

4-156. RADIO SET CONTROL C-451A/ARC-21. (See schematic diagram figure 19-3.)

4-157. Mounted on the rear of the panel are two frequency control drums on which the desired frequency for each of 20 channels is set up. Mounted on the drums are movable buttons, one for each digit in each channel frequency. One button, having 20 positions, selects both units and half-units. The buttons close contacts of switches S1307 and S1308 to complete two arms of a resistance bridge.

4-158. The "CHANNEL" selector on the front panel indicates the number of the channel setting up the bridge contacts. Access to the drums is provided by two covers on the front panel. Inside one cover is attached a setting tool for the buttons. On the left-hand side of the top drum is a channel number indicating the channel being pre-set. The buttons are positioned under the numbers representing the digits of the frequency being set up.

4-159. RADIO SET CONTROL C-455/ARC.

4-160. Radio Set Control C-455/ARC is a supplementary unit containing controls only for "VOICE" operations and channel selection. It contains coding switches for controlling the ratchet drive mechanism of Radio Set Control C-451A/ARC-21.

4-161. ADAPTER, KEYER GROUP MX-1394/ARC-21.

4-162. Adapter, Keyer Group MX-1394/ARC-21 automatically provides the necessary operating functions for setting frequency, power output, type of transmission and tune cycling once the emergency "ON" switch on Control Panel C-790/ARA-26 is operated. After tune-up is completed, Keyer KY-65/ARA-26 keys the transmitter with coded signals, the operation continuing until it is shut off by the operator or power failure. The frequency control components are a ratchet driven switch and bridge resistors, which take the place of those in the Radio Set Control C-451A/ARC-21 when this equipment is in use.

4-163. CASE, RECEIVER-TRANSMITTER CY-1279A/ARC-21. (See figure 18-1.)

4-164. The Case, Receiver-Transmitter CY-1279A/ARC-21 is the heat exchanger and pressurized case of the Receiver-Transmitter RT-128A/ARC-21. While only sea-level pressure is used, the case must be airtight to prevent loss of transmitter power at high altitudes. Two blowers are used to keep the equipment cool. The inside blower, B2002, circulates the internal air around the equipment and through fins on the inside of the cylindrical casing. The outside blower, B2001, circulates cooling air through a similar set of fins on the outside but in the opposite direction. This blower is started by the thermostat S2001 when the internal temperature rises above 43°C (109°F).

4-165. If a constant-speed blower were used. the cooling action would be reduced or increased due to the reduction of air pressure. To prevent this, the blower has a resistor, R2001, in series with it to reduce its speed and yet is designed for satisfactory cooling at sea level. As the altitude is increased the load on the motor will be reduced resulting in a lower drop in voltage across the resistor R2001. This will then cause the motor to speed up and drive as much air through the outside cooling fins as at sea level.

Filter Z2001 prevents interference from the motors being passed through the wiring. The jumper between pins C and D of jack J2005 is an interlock to prevent operating the transmitter unless the blower motors are energized.

4-166. RELAY ASSEMBLY RE-135B/ARC-21.

4-167. The Relay Assembly RE-135B/ARC-21 contains the various relays for controlling the type of emission and automatic tuning procedures.

4-168. CHASSIS, RECEIVER-TRANSMITTER MX-1424A/ARC-21. (See figure 17-4.)

4-169. The Chassis, Receiver-Transmitter MX-1424A/ARC-21 is the frame on which the various chassis are mounted for the Receiver-Transmitter RT-128A/ARC-21. This frame fits into the Case, Receiver-Transmitter CY-1279/ARC-21. The frame contains the interconnection cabling to two or more of the plug-in chassis. Among these components are the heaters, timing mechanism, input filter and control relays.

SECTION V

DESCRIPTION OF SYSTEM TIE-IN OF EQUIPMENT AND ACCESSORIES

5-1. The Radio Set AN/ARC-21 System is shown in the Simplified Block Diagram, figure 5-1. The Radio Receiver-Transmitter RT-128A/ARC-21 contains a number of chassis comprising a receiver, a transmitter, and the necessary control equipment for automatic tuning.

5-2. The receiver section consists of a highly selective, sensitive, high-frequency receiver for cw, voice, and frequency-shift keying reception. The transmitter is a long-range, stable automatic-tuning transmitter for cw, voice, and frequency shift keying transmission.

5-3. A stabilized generator produces and controls the 44,000 possible frequencies which, after being doubled, are used for transmission and reception. Tuning is entirely automatic and no facilities are provided for external manual tuning.

5-4. Radio Set Control C-451A/ARC-21 sets up the Receiver-Transmitter RT-128A/ARC-21 for type of operation and frequency of operation, Radio Set Control C-455/ARC provides control for voice operation only, with a selection of 20 channels which have been pre-set on Radio Set Control C-451A/ARC-21. Either type control unit can take equipment control away from any other control unit at any time.

5-5. The choice of power supply depends on the power sources available in the aircraft. Dynamotors or electronic rectifiers are used as required with Radio Set AN/ARC-21.

5-6. Frequency control is achieved through a switching and motor drive system controlled by four self-balancing digit bridge systems. Two arms of each digit bridge are in the Radio Set Control C-451A/ARC-21 and the other two arms of each digit bridge are in the Radio Receiver-Transmitter RT-128A/ARC-21, together with the bridge relay which is connected in place of the meter in conventional bridge circuits. When the bridges are balanced the proper switch positions are in use for the particular frequency setup.

5-7. The antenna coupler (not supplied) automatically matches the antenna impedance to the output impedance of the antenna at the operating frequency. Control information for the antenna coupler is furnished by the receiver-transmitter.

5-8. At various frequencies it is necessary to ground the far end of the antenna. This is accomplished by Relay, Solenoid RE-132/ARC energized from Coupler, Antenna CU-145/ARC.

5-9. Audio input and output and keying circuits are provided through the AN/AIC-10 interphone system (not supplied).

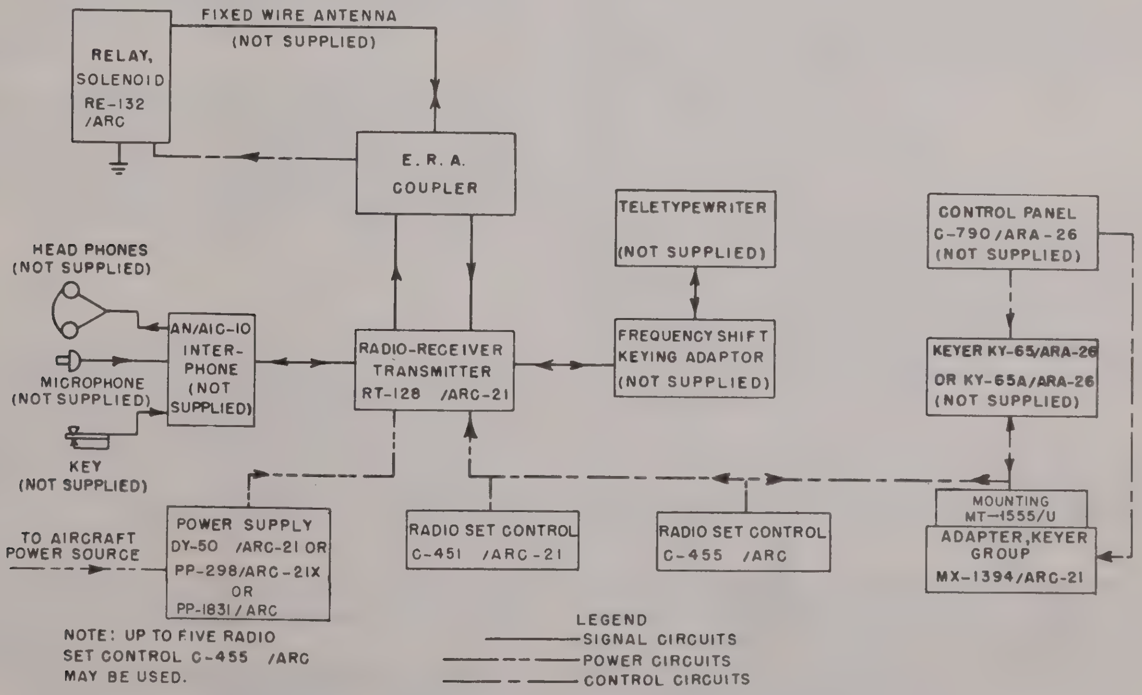

FIXED WIRE ANTENNA
(NOT SUPPLIED)
RELAY, SOLENOID RE-132 /ARC
E.R.A. COUPLER
TELETYPEWRITER
(NOT SUPPLIED)
CONTROL PANEL C-790/ARA-26 (NOT SUPPLIED)
HEAD PHONES (NOT SUPPLIED)
AN/AIC-10 INTER-PHONE (NOT SUPPLIED)
MICROPHONE (NOT SUPPLIED)
RADIO-RECEIVER TRANSMITTER RT-128 /ARC-21
FREQUENCY SHIFT KEYING ADAPTOR (NOT SUPPLIED)
KEYER KY-65/ARA-26 OR KY-65A/ARA-26 (NOT SUPPLIED)
KEY (NOT SUPPLIED)
MOUNTING MT-1555/U
ADAPTER, KEYER GROUP MX-1394/ARC-21
TO AIRCRAFT POWER SOURCE
POWER SUPPLY DY-50 /ARC-21 OR PP-298/ARC-21X OR PP-1831/ARC
RADIO SET CONTROL C-451 /ARC-21
RADIO SET CONTROL C-455 /ARC
NOTE: UP TO FIVE RADIO SET CONTROL C-455 /ARC MAY BE USED.
LEGEND
SIGNAL CIRCUITS
POWER CIRCUITS
CONTROL CIRCUITS

Figure 5-1. Radio Set AN/ARC-21, Simplified Block Diagram

5-10. Teletype operation is provided by feeding the teletype signals into a frequency shift keying adapter. The teletype signals are then converted into positive and negative frequency shifts which are applied to the carrier. In reception, the frequency shifts are converted into teletype signals. Neither the teletypewriter nor frequency shift keying adapter is supplied.

5-11. The Adapter, Keyer Group MX-1394/ARC-21 automatically provides the necessary operating functions for setting frequency, power output, type of transmission and tune cycling once the emergency "ON" switch on Control Panel C-790/ARA-26 is operated. After tune-up is completed the Keyer KY-65/ARA-26 keys the transmitter with coded signals, the operation continuing until it is shut off by the operator or power failure.

SECTION VI

INSTRUCTIONS FOR CHECK-OUT OR ANALYSIS

6-1. GENERAL.

6-2. SCOPE.

6-3. This section contains instructions for trouble analysis of the complete Radio Set AN/ARC-21, which will enable trouble to be traced to a specific component. Also included are general instructions and information relevant to the maintenance sections for each component (Sections VII through XXIII).

6-4. **RELATIONSHIP TO OTHER MAINTENANCE SECTIONS.** Because of the complex interrelation between components of Radio Set AN/ARC-21, most components cannot be checked independently of the others. Therefore most trouble analysis requires that the component be checked in an operating system such as the bench test set-up described in Section II. After the trouble has been localized to a particular component according to instructions in this section, the specific cause may be pinpointed by the procedures given in the applicable maintenance section. Generally the component will be removed for inspection and then patched back into the system for detailed checks.

6-5. **ADDITIONAL INFORMATION.** Because of the complexity of the equipment, it is not possible to give every conceivable trouble symptom. However, a good knowledge of equipment theory should enable service personnel to locate the cause of any unusual symptom. The diagrams in Section IV will be helpful in tracing any equipment function through the component involved.

6-6. **RADIO RECEIVER-TRANSMITTER RT-128A/ARC-21.** No separate maintenance section is devoted to this equipment, since its components are all treated separately. Paragraphs 6-25 through 6-60 describe procedures for localizing trouble to specific components.

6-7. DIAGRAMS.

6-8. **DIAGRAMS INCLUDED.** Sections VII through XXIII of this handbook contain both schematic and connection diagrams of all components of Radio Set AN/ARC-21. In addition, Section IV contains a detailed block diagram of Radio Receiver-Transmitter RT-128A/ARC-21 and block diagrams and simplified schematics of the tuning and frequency control functions.

6-9. **USE OF DIAGRAMS.** The schematic diagrams are needed for both component and inter-component trouble analysis.

a. For tracing circuits between components of Radio Receiver-Transmitter RT-128A/ARC-21, refer to the simplified schematic diagram of Section IV. If these diagrams do not show the particular circuit involved, the interconnections can be picked up on the schematic diagram for Chassis, Receiver-Transmitter MX-1424A/ARC-21 (figure 17-4).

b. Interconnections between Radio Receiver RT-128A/ARC-21, other components, and accessories can be traced with the aid of the installation diagrams (figures 6-9 and 6-10) and bench test cable fabrication illustrations and tables in Section III.

6-10. Connection diagrams show actual chassis connections, wire sizes, color coding, and any special precautions or techniques that have been followed in manufacture. Before replacing any detail part, always check the connection diagram and observe all instructions carefully.

6-11. **DRAWING SYMBOLS.** For the most part drawing symbols used in the diagrams either conform to applicable military standards or resemble the standard symbols closely enough for easy recognition. All drawing symbols used are identified in figures 6-1 and 6-2. Figure 6-1 shows symbols conforming to standards of MIL-STD-15A, figure 6-2 shows those that do not.

6-12. Included in the schematic diagrams are test point symbols. Some are star-encircled numbers to indicate major test points and others are single or double letters with a circle around them to indicate secondary test points. These test point identifications appear on the schematic diagram only; not on the equipment itself. Certain test points and jacks are identified on the equipment by "TP" and "J" symbol numbers, which are also shown on the schematic diagram. Care should be taken not to confuse these various identifications.

6-13. BENCH TEST SET-UP.

6-14. A complete bench setup should be available so that the component to be serviced can be connected into the system by test cables found in Test Kit MK-136/ARC-21. If the test kit is not available, these cables may be fabricated from data given in Section III of this Handbook. Such an arrangement provides proper voltage inputs and permits overall operation to be rapidly checked.

6-15. The setup should include a complete bench test system, as described in Section III, with the type of power supply used suited to the power source available.

6-16. A fixed wire antenna should be erected to permit receiver checking. The antenna characteristics are not critical. Dummy Load DA-72/U will be required to check the ERA Coupler units or the transmitter section of the Radio Receiver-Transmitter RT-128A/ARC-21.

6-17. The units should be arranged without their ex-

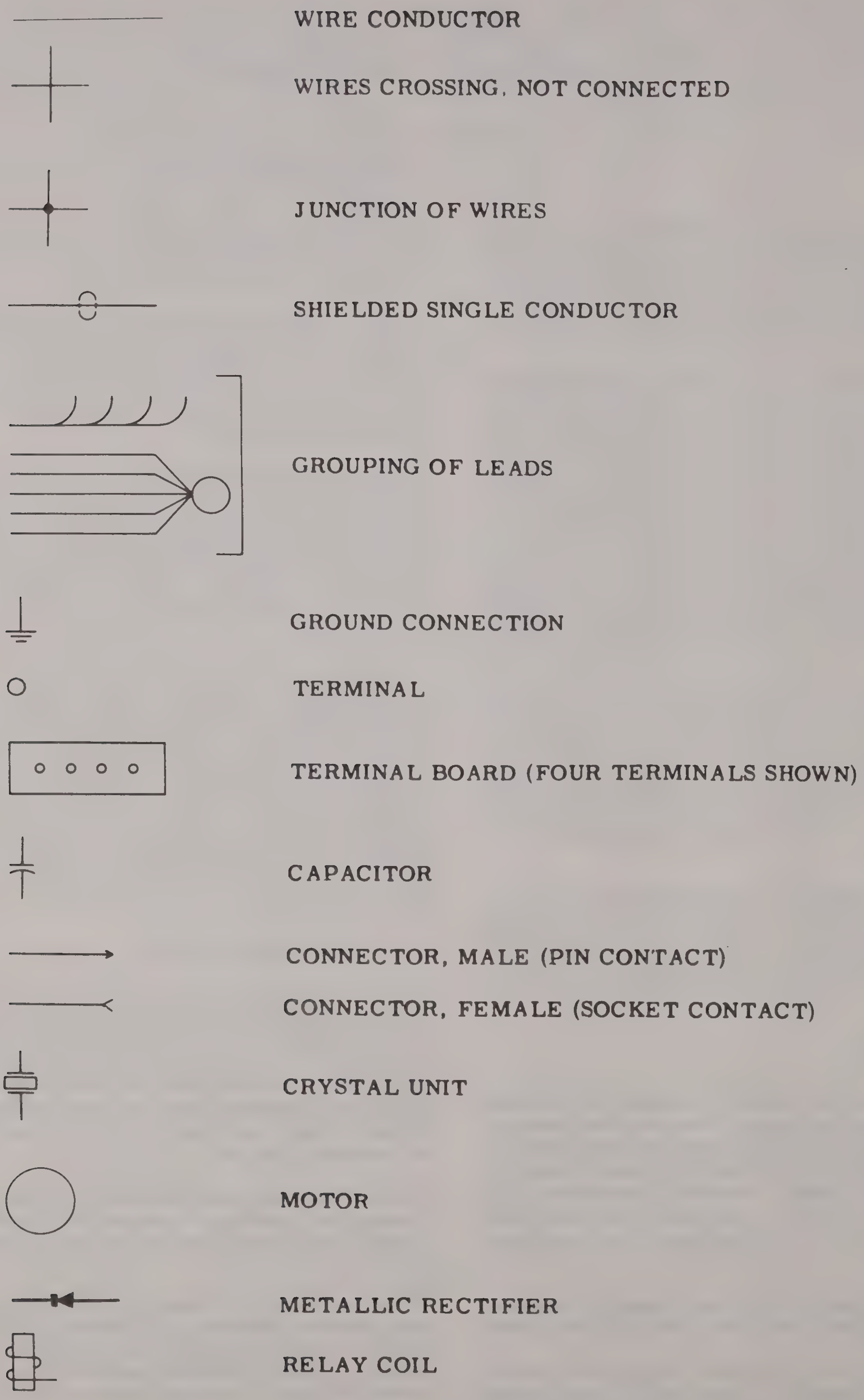
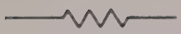
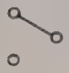
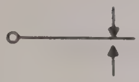

WIRE CONDUCTOR
WIRES CROSSING, NOT CONNECTED
JUNCTION OF WIRES
SHIELDED SINGLE CONDUCTOR
GROUPING OF LEADS
GROUND CONNECTION
TERMINAL
TERMINAL BOARD (FOUR TERMINALS SHOWN)
CAPACITOR
CONNECTOR, MALE (PIN CONTACT)
CONNECTOR, FEMALE (SOCKET CONTACT)
CRYSTAL UNIT
MOTOR
METALLIC RECTIFIER
RELAY COIL

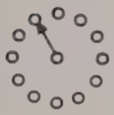
Figure 6-1. Drawing Symbols Conforming to Military Standards (Sheet 1 of 3)

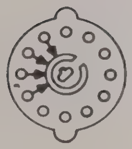

RESISTOR

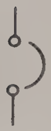
SWITCHES


SINGLE POLE, DOUBLE THROW SWITCH

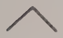

TRANSFER CONTACT

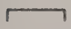

SELECTOR SWITCH

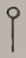

WAFER SWITCH

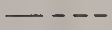

CIRCUIT BREAKER

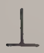
ELECTRON TUBES


DIRECTLY HEATED (FILAMENTARY) CATHODE


INDIRECTLY HEATED CATHODE


COLD CATHODE (INCLUDING IONIC HEATED CATHODE)


GRID (INCLUDING BEAM CONFINING OR BEAM FORMING ELECTRODES)


ANODE OR PLATE (INCLUDING COLLECTOR AND FLUORESCENT TARGET)

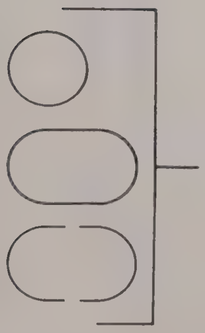

ENVELOPE

Figure 6-1. Drawing Symbols Conforming to Military Standards (Sheet 2 of 3)

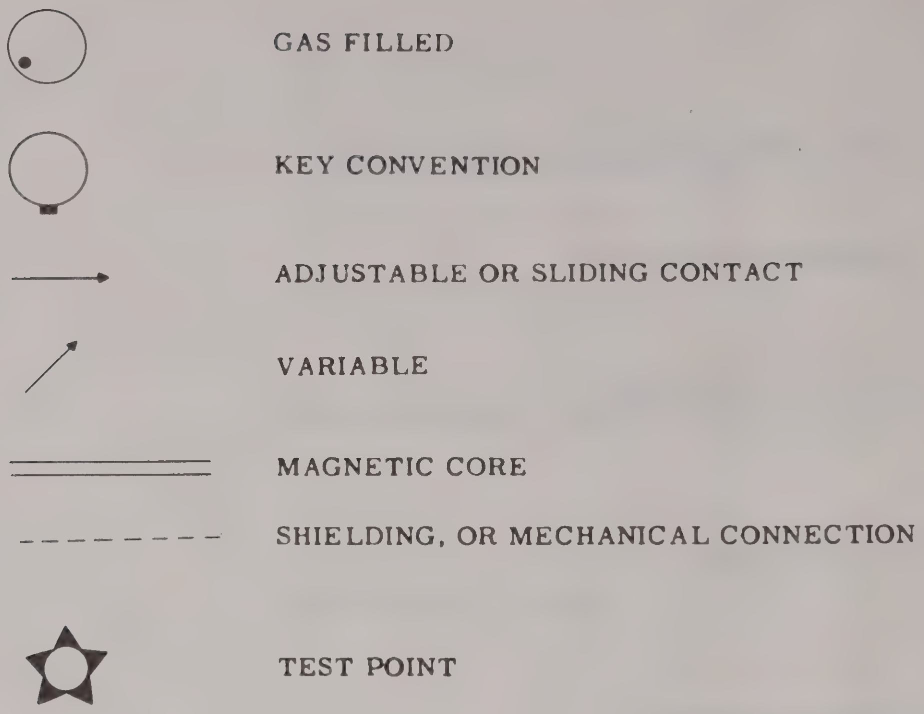

GAS FILLED
KEY CONVENTION
ADJUSTABLE OR SLIDING CONTACT
VARIABLE
MAGNETIC CORE
SHIELDING, OR MECHANICAL CONNECTION
TEST POINT

Figure 6-1. Drawing Symbols Conforming to Military Standards (Sheet 3 of 3)

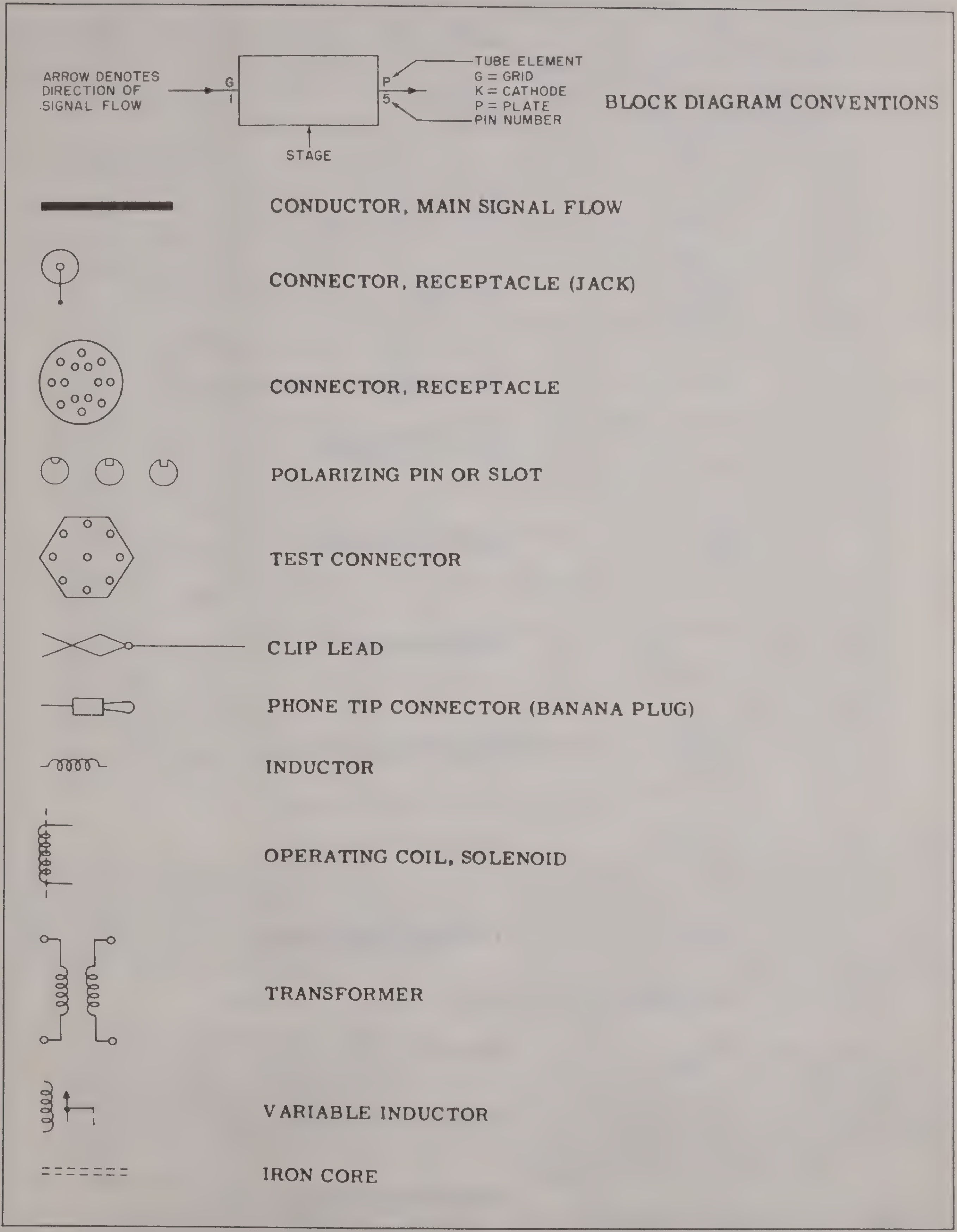

ARROW DENOTES DIRECTION OF SIGNAL FLOW
G
1
P
5
TUBE ELEMENT
G = GRID
K = CATHODE
P = PLATE
PIN NUMBER
STAGE
BLOCK DIAGRAM CONVENTIONS
CONDUCTOR, MAIN SIGNAL FLOW
CONNECTOR, RECEPTACLE (JACK)
CONNECTOR, RECEPTACLE
POLARIZING PIN OR SLOT
TEST CONNECTOR
CLIP LEAD
PHONE TIP CONNECTOR (BANANA PLUG)
INDUCTOR
OPERATING COIL, SOLENOID
TRANSFORMER
VARIABLE INDUCTOR
IRON CORE

Figure 6-2. Drawing Symbols Not Conforming to Military Standards (Sheet 1 of 2)

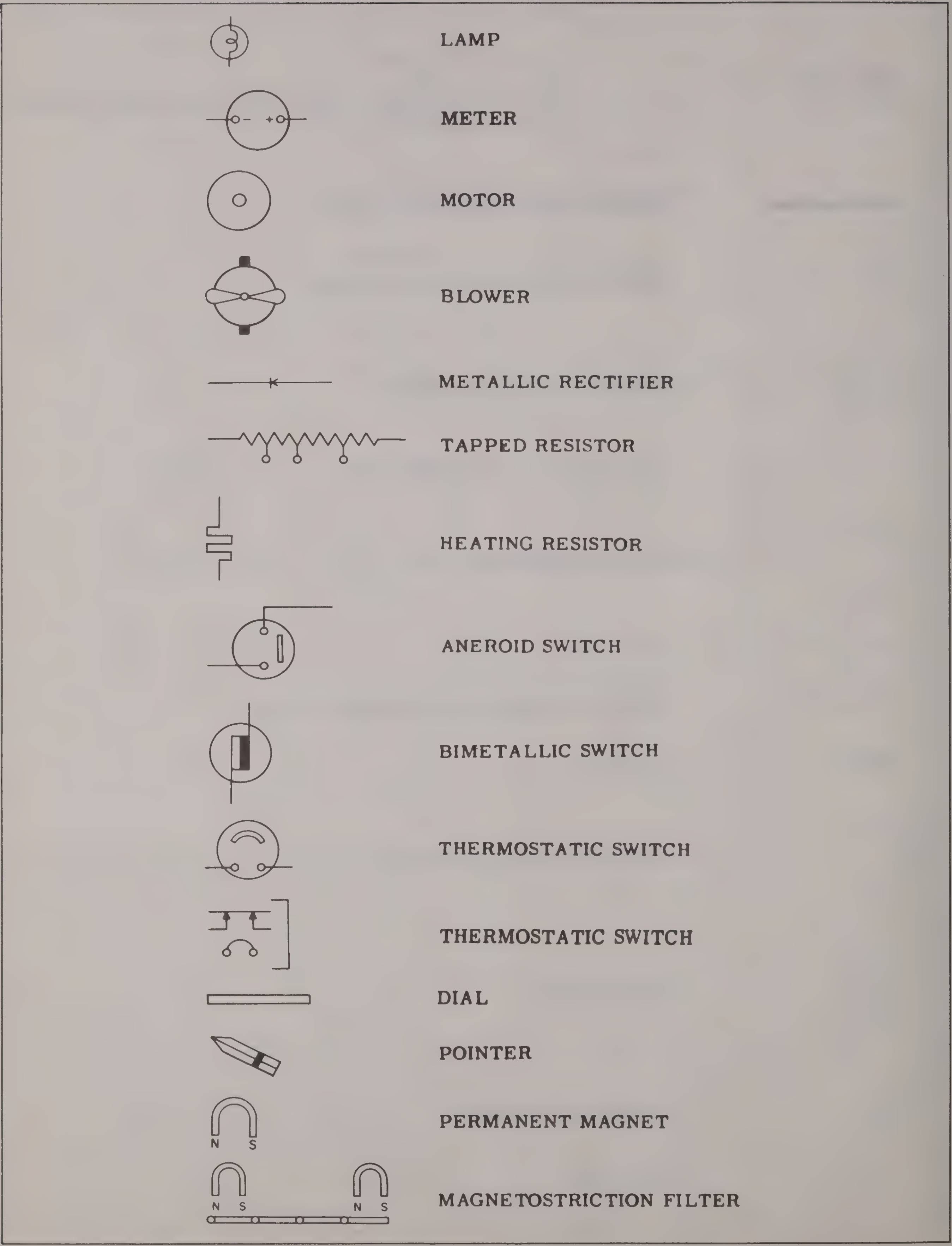
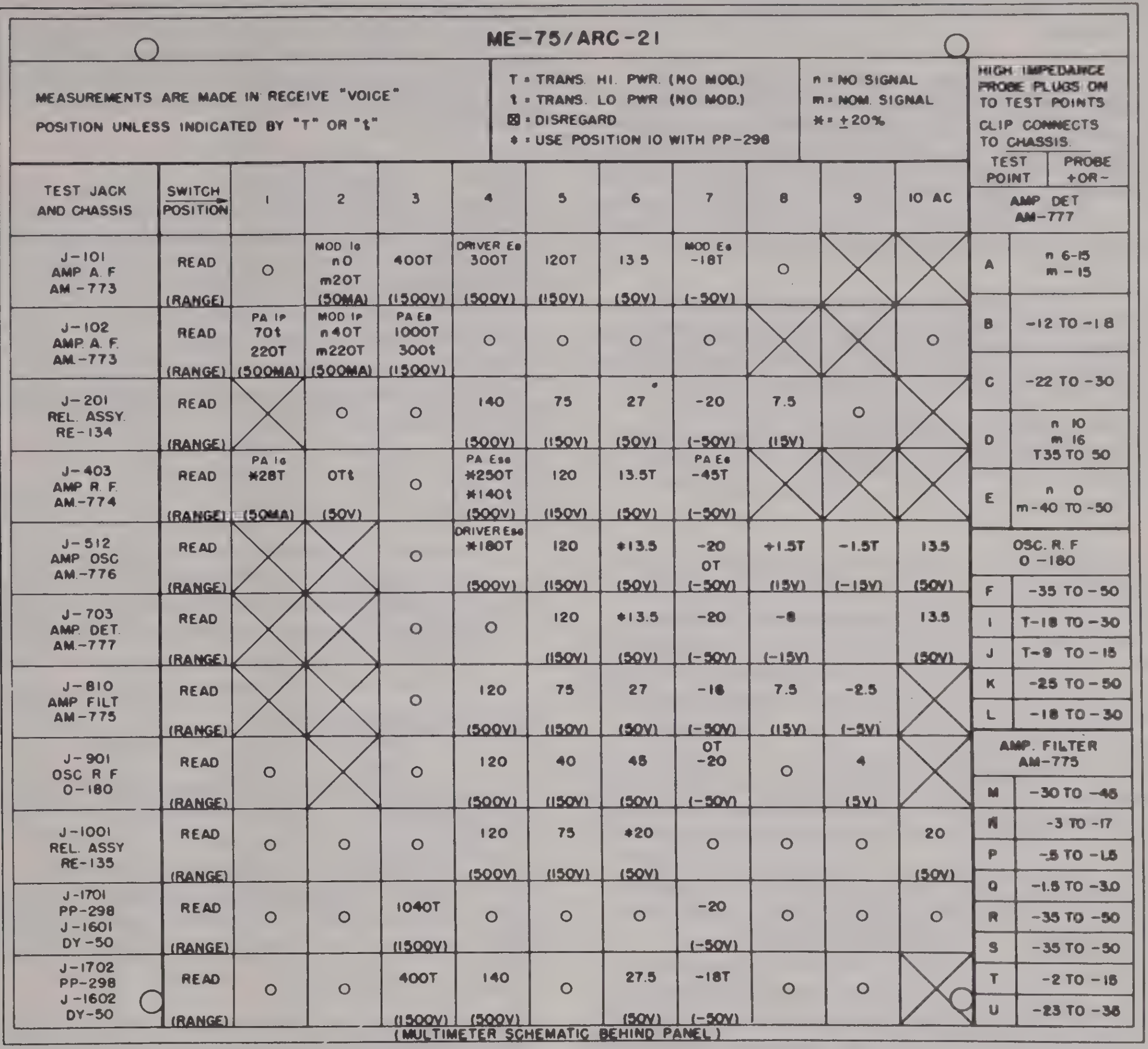

LAMP
METER
MOTOR
BLOWER
METALLIC RECTIFIER
TAPPED RESISTOR
HEATING RESISTOR
ANEROID SWITCH
BIMETALLIC SWITCH
THERMOSTATIC SWITCH
THERMOSTATIC SWITCH
DIAL
POINTER
PERMANENT MAGNET
N
S
MAGNETOSTRICTION FILTER
N
S
N
S

Figure 6-2. Drawing Symbols Not Conforming to Military Standards (Sheet 2 of 2)



ME-75/ARC-21

MEASUREMENTS ARE MADE IN RECEIVE "VOICE" POSITION UNLESS INDICATED BY "T" OR "t"

T = TRANS. HI. PWR. (NO MOD.)
t = TRANS. LO PWR (NO MOD.)
☒ = DISREGARD
♦ = USE POSITION 10 WITH PP-298

n = NO SIGNAL
m = NOM. SIGNAL
* = ±20%

TEST JACK AND CHASSIS	SWITCH POSITION	1	2	3	4	5	6	7	8	9	10 AC
J-101 AMP A. F AM-773	READ (RANGE)	○	MOD Io n0 m20T (50MA)	400T (1500V)	DRIVER Eo 300T (500V)	120T (150V)	13.5 (50V)	MOD Eo -18T (-50V)	○	☒	☒
J-102 AMP. A. F. AM-773	READ (RANGE)	PA Ip 70t 220T (500MA)	MOD Ip n40T m220T (500MA)	PA Eo 1000T 300t (1500V)	○	○	○	○	☒	☒	○
J-201 REL. ASSY. RE-134	READ (RANGE)	☒	○	○	140 (500V)	75 (150V)	27 (50V)	-20 (-50V)	7.5 (15V)	○	☒
J-403 AMP R. F. AM-774	READ (RANGE)	PA Io *28T (50MA)	0Tt (50V)	○	PA Eso *250T *140t (500V)	120 (150V)	13.5T (50V)	PA Eo -45T (-50V)	☒	☒	☒
J-512 AMP OSC AM-776	READ (RANGE)	☒	☒	○	DRIVER Eso *180T (500V)	120 (150V)	♦13.5 (50V)	-20 0T (-50V)	+1.5T (15V)	-1.5T (-15V)	13.5 (50V)
J-703 AMP. DET. AM-777	READ (RANGE)	☒	☒	○	○	120 (150V)	♦13.5 (50V)	-20 (-50V)	-8 (-15V)		13.5 (50V)
J-810 AMP FILT AM-775	READ (RANGE)	☒	☒	○	120 (500V)	75 (150V)	27 (50V)	-18 (-50V)	7.5 (15V)	-2.5 (-5V)	☒
J-901 OSC R F 0-180	READ (RANGE)	○	☒	○	120 (500V)	40 (150V)	45 (50V)	0T -20 (-50V)	○	4 (5V)	☒
J-1001 REL. ASSY RE-135	READ (RANGE)	○	○	○	120 (500V)	75 (150V)	♦20 (50V)	○	○	○	20 (50V)
J-1701 PP-298 J-1601 DY-50	READ (RANGE)	○	○	1040T (1500V)	○	○	○	-20 (-50V)	○	○	○
J-1702 PP-298 J-1602 DY-50	READ (RANGE)	○	○	400T (1500V)	140 (500V)	○	27.5 (50V)	-18T (-50V)	○	○	☒

HIGH IMPEDANCE PROBE PLUGS ON TO TEST POINTS

CLIP CONNECTS TO CHASSIS.

TEST POINT	PROBE +OR-
AMP DET AM-777	
A	n 6-15 m -15
B	-12 TO -18
C	-22 TO -30
D	n 10 m 16 T35 TO 50
E	n 0 m -40 TO -50
OSC. R. F 0-180	
F	-35 TO -50
I	T-18 TO -30
J	T-9 TO -15
K	-25 TO -50
L	-18 TO -30
AMP. FILTER AM-775	
M	-30 TO -45
N	-3 TO -17
P	-.5 TO -1.5
Q	-1.5 TO -3.0
R	-35 TO -50
S	-35 TO -50
T	-2 TO -15
U	-23 TO -38

(MULTIMETER SCHEMATIC BEHIND PANEL)

Figure 6-3. Multimeter ME-75/ARC-21 Chart

ternal cases to permit full accessibility. A test cradle, fitted with rollers that support the front and back flanges of the RT-128A/ARC-21 chassis to permit its rotation, will be found convenient when inserting and removing chassis or connecting test cables. Use Stand, Maintenance MT-1164/U, if available.

NOTE

> When using the 60-cycle power supply (not supplied), remove lead from red (+) terminal of rectifier CR201, in Relay Assembly RE-134A/ARC-21 and connect this lead to terminal 4 of relay K202. Replace this lead before returning to service.

6-18. TEST EQUIPMENT.

6-19. MULTIMETER ME-75/ARC-21. This meter has been designed for the particular purpose of servicing the AN/ARC-21 equipment. It consists of a multiple-scale volt-milliammeter which may be connected by a rotary selector switch to a test plug, a pair of test leads, or a pair of polarized probes. Built-in shunts and multipliers are switched into the circuit as various test leads are selected. A rectifier is provided for a-c measurements. A chart (figure 6-3) is mounted in the cover of the meter which gives normal indications for the various settings of the selector switch for the various chassis test jacks and voltage test points. THE METER CASE MUST BE GROUNDED WHENEVER THE EXTERNAL LEADS ARE USED.

6-20. A flexible cable fitted with a nine-pin test plug is used to connect the meter to test jacks located on the individual chassis. Ten switch positions are used to obtain the voltage and current readings available through the use of the plug. The number 10 position is used for filament voltage indication when an a-c power supply is used.

6-21. Two test leads are included for general servicing. Six switch positions provide four conventional d-c voltmeter ranges at 20,000 ohms per volt and one a-c range of 0-50 volts. The 1500-volt d-c and 50-

volt a-c ranges are approximately 6700 ohms per volt. GROUND THE METER CASE WHENEVER USING THE TEST LEADS.

6-22. Two additional switch positions marked "+HI IMP" and "-HI IMP" connect the meter to an insulated test probe and clip. The probe has a recessed contact and is designed to mate with minor test points which have suitable multipliers built into the various chassis. USE PROBE ONLY ON MINOR TEST POINTS INDICATED TO AVOID METER DAMAGE.

6-23. An "OFF" position on the selector switch places a short across the meter terminals to protect it from the accidental application of voltages in handling and damp the movement during transportation.

6-24. OTHER TEST EQUIPMENT. See Section III for other test equipment required.

6-25. ANALYSIS.

6-26. GENERAL. In general the routine procedure for checking each component is as follows:

a. First clean any dust off the component and examine it carefully for signs of breakage or mechanical damage. Observe carefully if any detail parts show visible signs of distress or overheating, as evidenced by charred or discolored surfaces or seepage from potted or sealed components.

b. Where motor-driven mechanisms are employed in a chassis, check their operation first, and then carry out referenced procedures for adjustment or repair.

c. Connect the component into the bench setup, observe tubes for heating and check the circuits by procedures given in a Trouble Analysis Chart.

d. If normal indications are obtained at paragraph c, particularly if repairs have been made previously, give the component a minimum performance check to ascertain if it meets the standards listed in the applicable maintenance section and an operating check in the AN/ARC-21 setup.

e. If abnormal indications are obtained at paragraph c, further checking will be necessary in accordance with each chassis maintenance procedure. If defective components are not located, the chassis may require adjustment or alignment, procedures for which are given. Radio Receiver-Transmitter RT-128A/ARC-21 and a special alignment tool is clipped to the frame of the Radio Receiver R-224/ARR-36 to make adjustments necessary in alignment procedures. Test Kit, Radio MK-136/ARC-21 also contains an alignment tool and spare Bristo wrenches. These items are contained in Case Test Kit CY-1408/ARC-21.

CAUTION

> During servicing and testing of the equipment do not run the band switch, receiver tune, and servo selector drive motors for a period of more than 60 seconds at a time. After each 60-second running allow a 60-second rest period to prevent damage and possible burn-out of the motors or bridge resistors since these items are designed for intermittent service only.

6-27. TUBES. Tubes in a suspected circuit should always be checked first, preferably by replacing them, one at a time, with tubes known to be good or by checking on a Tube Tester TV-7/U or I-177/U and discarding tubes that have decreased to 70 percent of rated output.

6-28. Examine the defective assembly for tube heater failures. Because of the series heater circuits, a tube heater failure is not immediately traceable to the defective tube. Tube heater continuity checks with an ohmmeter must be made on each one of the particular group of inoperative tubes to locate the defect. If there is no evidence of tube heater failures, replace all tubes in the defective unit and recheck in bench setup. If still inoperative, return for higher echelon testing and repair.

CAUTION

> Tube filaments in some chassis are in series parallel combinations. Cut off power when removing tubes and do not operate chassis with open filament tubes as voltage shifts may damage other tubes. When replacing subminiature tubes use those made to "A" specification and with short (13/64 inch) leads.

6-29. SYSTEM TROUBLE ANALYSIS.

6-30. FAILURE OF RECEIVER-TRANSMITTER TO TUNE.

6-31. GENERAL. Use the following "Observed Symptoms" and "Procedure" to identify and locate the trouble, with the "CW BROAD-CW SHARP-VOICE-FSK" switch in the "CW BROAD" position and the key up.

6-32. OBSERVED SYMPTOMS. "CONTROL" switch returns to "OFF" position at end of timing cycle (approximately 40 seconds) or continued absence of receiver noise.

6-33. PROCEDURES. The following procedure should locate the defective unit:

a. Select another channel or pre-set frequency near the low-frequency range of the equipment (2.2 to 3.5 megacycles) and turn the "CONTROL" switch to "ON." If the tuning cycle is completed and the characteristic receiver background noise is heard, the equipment is operating satisfactorily.

b. Switch to the initially desired frequency channel. If the tuning cycle is completed and the characteristic receiver background noise is heard, the equipment is operating satisfactorily.

c. If the observed symptoms continue, repeat steps a and b after replacing the Radio Set Control C-451A/ARC-21 with one known to be good. Continue to step d if observed symptoms continue.

d. Check power supply output voltages by plugging the special test plug of the Multimeter ME-75/ARC-21 into jacks J1601 and J1602, major test points 10 and 11, of the Dynamotor Assembly DY-50/ARC-21 or jacks J1701 and J1702, major test points 12 and 13, of Power Supply PP-298/ARC-21X, whichever is applicable. Manipulate the multimeter switch in accordance with the chart in the cover and the information in paragraph 6-19. Replace the power supply with one of the same type if voltages are not correct. If the power supply voltages are correct and the observed symptoms continue, refer to paragraph 6-42 for further trouble-shooting of the receiver-transmitter.

6-34. FAILURE OF TRANSMITTER TO TUNE.

6-35. GENERAL. Satisfactory receiver operation, but inability of the transmitter to tune and load correctly, may be due to troubles in the transmitter ERA Coupler, the antenna or the Relay Solenoid RE-132/ARC.

6-36. Use the following observed symptoms with the "CW BROAD-CW SHARP-VOICE-FSK" switch in the "CW BROAD" position, "VOLUME" control at maximum, and key held down. An alternative is the "VOICE" position with the "VOLUME" and "NOISE" controls at maximum and with the microphone "push-to-talk" button pressed.

6-37. OBSERVED SYMPTOMS. "CONTROL" switch turns to "OFF" position at end of the transmitter timing cycle (40 seconds), or continued absence of sidetone.

6-38. PROCEDURE. Follow the following procedure to localize the trouble:

a. Turn the "CONTROL" switch to "ON."

b. Change the receiver-transmitter to a widely different frequency channel. Wait for the receiver to tune. If necessary, change the "CW SHARP-CW BROAD-VOICE-FSK" switch momentarily to "CW BROAD" to note, by the receiver noise, when tuning is completed.

c. Hold down the key or press the microphone "push-to-talk" button, as applicable, to initiate transmitter tuning.

d. If observed symptoms persist, disconnect all cables and the antenna lead from the ERA Coupler and connect the Dummy Load, Electrical DA-72/U to the large coaxial cable leading from the receiver-transmitter.

e. Rechannel the receiver and again initiate transmitter tuning. If the transmitter tunes successfully, as indicated by presence of sidetone after about 10 seconds, replace the coupler. If the transmitter does not tune when terminated by Dummy Load, Electrical DA-84/ARM-6 refer to paragraph 6-42 for further trouble shooting procedures.

CAUTION

> Dummy Load, Electrical DA-84/ARM-6 will not dissipate 100 watts of power continuously. Operate the transmitter intermittently (duty cycle 30 percent or less) on "HI" power.

f. Check Relay, Solenoid RE-132/ARC by checking antenna continuity to ground. Use Multimeter TS-297/U. Continuity should appear closed when 27.5 volts dc is applied to wire 606A (of the system wiring) and open when wire 606A has no voltage. Replace Relay, Solenoid RE-132/ARC if necessary. Check the antenna itself and the lead-in against improper shorts or opens.

g. If trouble still has not been located, again check receiver and transmitter tuning with all units replaced or otherwise known to be good. If trouble still persists, disconnect all units from the system wiring and check the wiring thoroughly, using Multimeter TS-297/U. Repair the system wiring if necessary.

6-39. RADIO SET CONTROL C-451A/ARC-21.

6-40. GENERAL. Trouble in the Radio Set Control C-451A/ARC-21 will result in loss of control for one or more functions. Only detail checking of the unit will be conclusive, since the trouble may be in the cabling or the control relays, and their circuits. Substitute a radio set control that is known to be good. Check the controls for operation as described in the following paragraph.

6-41. PROCEDURE. Check the operating controls as follows:

a. Check the "POWER" switch by connecting the 50-ohm load to the transmitter output jack J2001. With the transmitter operating in high power, bring the RF Monitoring Probe ID-263/U near the dummy load using care not to drive the pointer off-scale. With the transmitter operating, note the reading with the "POWER" switch in the "HI" position (about 70 volts) and then in the "LOW" position. Turn the transmitter off before operating the "POWER" switch. The meter reading should be considerably less (about 25 volts) when the "POWER" switch is in the "LOW" position.

b. While receiving signals on both "CW" and "VOICE," check to see that the range of the "VOLUME" control is adequate.

c. On "VOICE" operation, adjust the "NOISE" control over its entire range when not receiving signals. At the extreme counterclockwise position the random noise should be quite loud. It should gradually diminish and become inaudible as the "NOISE" control is turned counterclockwise and the squelch becomes operative.

d. Receive signals in the "CW BROAD" position and adjust the "CW TUNE" control for beat note variation. The variation should be about four kilocycles above and below zero beat.

e. Receive signals in the "CW SHARP" position and adjust the "CW TUNE." Tuning will be somewhat more critical than in step d since the bandwidth is less.

f. With no signals being received, check the noise in the "CW BROAD" and then the "CW SHARP" positions. The noise should have a characteristic ring in the "CW SHARP" position because of reduced bandwidth.

g. Change the channel to assure tune-up on a new channel.

h. Check the panel lamps by unscrewing all but one lamp and then replacing the remaining lamp with the others in turn. Return the good lamps to their sockets and replace the defective lamps with good ones. To replace the lamp, extract the lamp from the cap, using the finger nails or a knife to get under the ridge on the lamp base. Pull the lamp out of the cap and insert a new lamp. Screw the cap in place.

6-42. RECEIVER-TRANSMITTER TROUBLE SHOOTING.

6-43. GENERAL. If the transmitter will not tune up to the correct frequency or deliver sufficient power into the dummy load connected to jack J2001, the receiver-transmitter chassis will have to be removed from the heat exchanger.

6-44. Locate the defective chassis by substituting chassis known to be good for those in the receiver-transmitter. Later paragraphs list the symptoms and order of chassis removal to facilitate servicing.

6-45. PARTS REMOVAL. Paragraphs 6-46 through 6-49 describe the removal of the chassis and disassembly into components. See also figures 6-4 through 6-8.

6-46. To remove the chassis from the case, first disconnect the cables from the jacks to allow free movement of the receiver-transmitter. The plug in jack J2005 on Case, Receiver-Transmitter CY-1279A/ARC-21, need not be removed if the receiver is removed horizontally. Refer to Section II for the correct removal procedures and see following caution.

CAUTION

> Release pressure by depressing stem of air valve on front of unit until pressure within and without the case has balanced, before adjusting or loosening clamp nuts. When tightening clamp ring nuts a torque wrench should be used and a torque of 23 to 25 pound/inches is required. When testing for air leakage, pressurize to a maximum of 5 psi. If leak is at clamp ring, RELEASE AIR PRESSURE, then release clamp nuts, check "O" ring to see that the "O" ring is free of defects and the mounting surfaces are clean, flat, smooth and the "O" ring is properly positioned. Then secure clamp, tapping with a rawhide or plastic hammer while tightening as indicated above.

6-47. Individual components are secured with captive screws, and are equipped with handles for easy withdrawal. To remove, disconnect all wiring at the input connectors, loosen the captive screws, and pull the component straight out by the handles.

6-48. TUBE REMOVAL. The subminiature tubes are held in place by two different types of clamps: One is the open-end type shield which is removed by pressing downward and turning counterclockwise; the other is an open spring which can be turned down against the chassis. After releasing the clamp, the tubes are pulled directly out of the socket. In the Amplifier-Oscillator AM-776A/ARC-21 the top cover of the individual boxes must be removed to give access to the tubes.

6-49. The miniature-type tubes are held in place by two springs that grasp the sides of the tubes. The springs are held aside and the tube pulled directly from its socket. For the modulator and power amplifier tubes, four springs engage a ridge in the glass. These tubes are pulled directly out of the sockets, with the springs spread slightly. Regulator tube V204 is removed by pushing it downward, turning it counterclockwise as far as it will go, and pulling it out of the socket.

6-50. RECEIVER TROUBLE SHOOTING.

6-51. GENERAL. Use the following observed symptoms and procedure to identify and locate the trouble. Failure to receive signals occurs with the following control settings: "CONTROL" to "ON" "VOLUME" maximum clockwise. "CW BROAD-CW SHARP-VOICE-FSK" switch to "CW BROAD" or "VOICE."

6-52. OBSERVED SYMPTOMS. Receiver-transmitter completes tuning cycle but no signals, voice or cw are received. Trials made on several frequencies where signals of reasonable strength are known to be present. "CONTROL" switch does not go to "OFF" after approximately 40 seconds (the timing cycle).

6-53. PROCEDURE. Locate the trouble by the following procedure:

a. If either voice or cw signals, but not both signals, can be received, replace the Radio Set Control C-451A/ARC-21.

b. If trouble still persists, remove the receiver-transmitter from the case and check the following units by substituting, in turn, each of the units from the inoperative receiver-transmitter in an operative bench setup:

Amplifier-Detector AM-777A/ARC-21
Relay Assembly RE-134A/ARC-21

c. Examine the defective assembly for tube heater failures. Because of the series heater circuits, a tube heater failure is not immediately traceable to the defective tube. Tube heater continuity checks with an ohmmeter must be made on each one of the particular group of inoperative tubes to locate the defect. If there is no evidence of tube heater failures, replace all tubes in the defective unit and recheck in bench setup. If still inoperative, reinsert the original set of tubes and return for higher echelon testing and repair.

d. If tests show no defective assembly, replace Chassis, Receiver-Transmitter MX-1424A/ARC-21, and remount all the original chassis assemblies and units. Return the defective chassis for higher echelon testing and repair.

NOTE

> The receiver tuning cycle, protective timer, and re-cycle circuits are so interrelated that failure to complete a normal frequency selection cycle results in the timer turning off the equipment after approximately 40 seconds.

6-54. Voltage and current variations as measured with the Multimeter ME-75/ARC-21, of more than 15 percent from the values given on the chart indicate trouble.

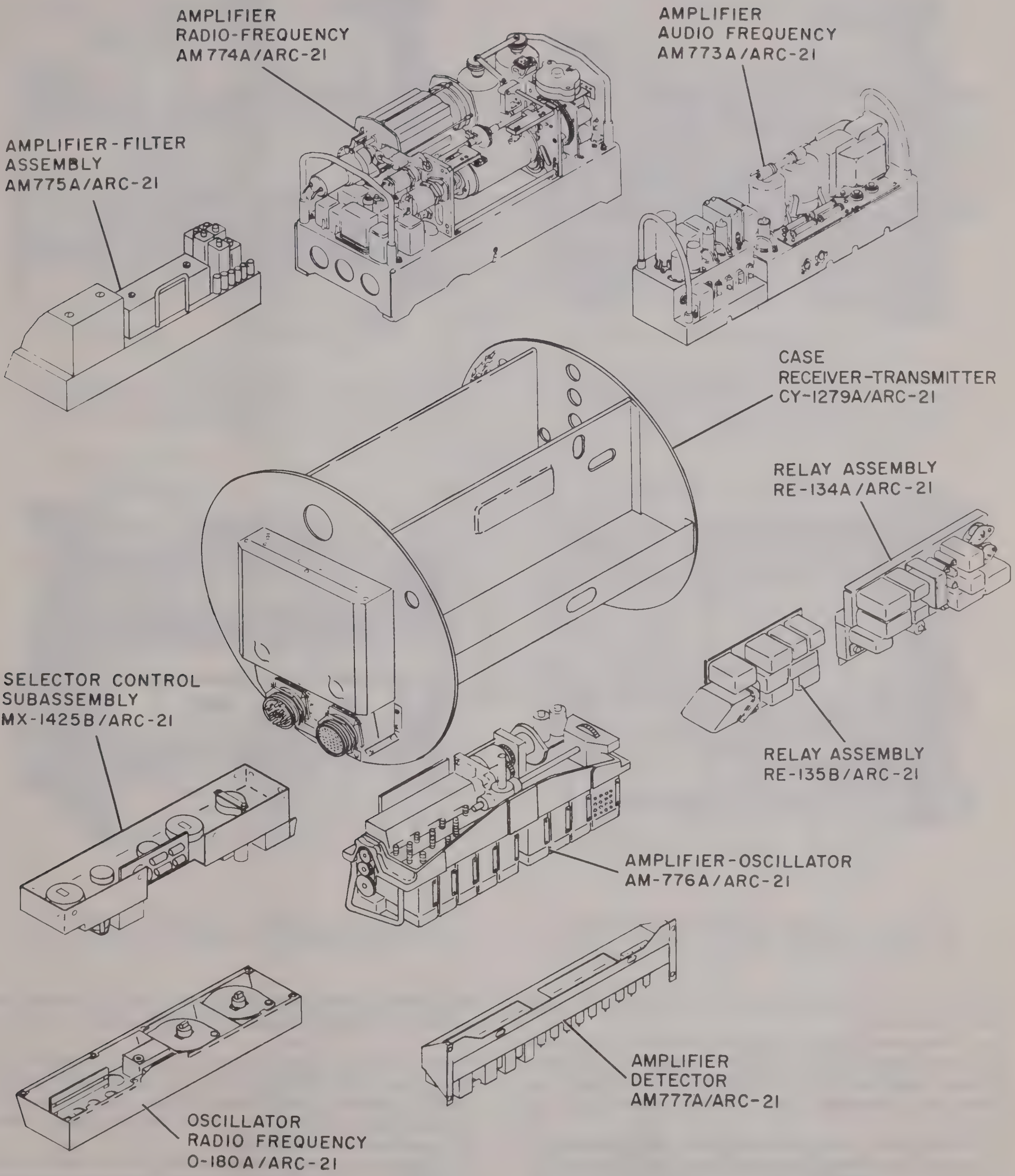

AMPLIFIER
RADIO-FREQUENCY
AM774A/ARC-21
AMPLIFIER
AUDIO FREQUENCY
AM773A/ARC-21
AMPLIFIER-FILTER
ASSEMBLY
AM775A/ARC-21
CASE
RECEIVER-TRANSMITTER
CY-1279A/ARC-21
RELAY ASSEMBLY
RE-134A/ARC-21
SELECTOR CONTROL
SUBASSEMBLY
MX-1425B/ARC-21
RELAY ASSEMBLY
RE-135B/ARC-21
AMPLIFIER-OSCILLATOR
AM-776A/ARC-21
AMPLIFIER
DETECTOR
AM777A/ARC-21
OSCILLATOR
RADIO FREQUENCY
O-180A/ARC-21

Figure 6-4. Components of Receiver-Transmitter, Radio RT-128A/ARC-21

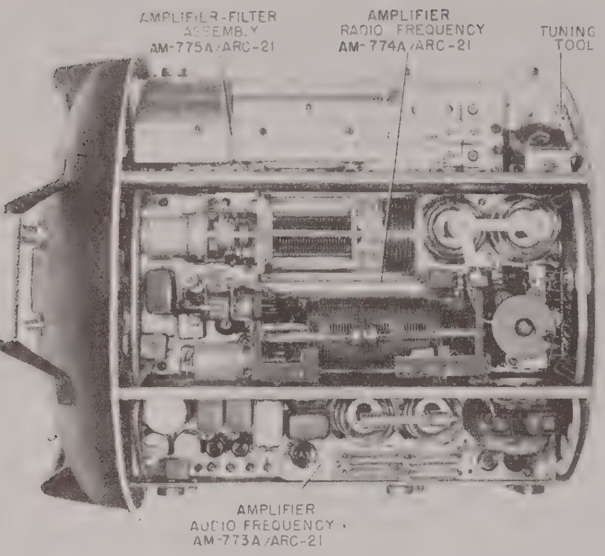

AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21
AMPLIFIER RADIO FREQUENCY AM-774A/ARC-21
TUNING TOOL
AMPLIFIER AUDIO FREQUENCY AM-773A/ARC-21

Figure 6-5. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Top, Units in Place

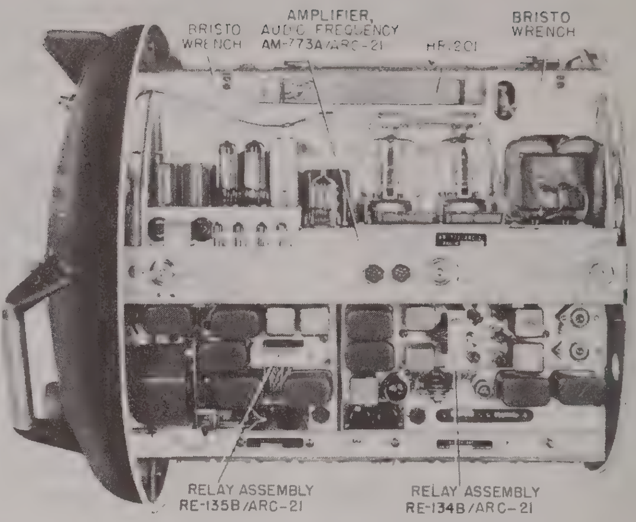

BRISTO WRENCH
AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21
HR1201
BRISTO WRENCH
RELAY ASSEMBLY RE-135B/ARC-21
RELAY ASSEMBLY RE-134B/ARC-21

Figure 6-7. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Right Side, Units in Place

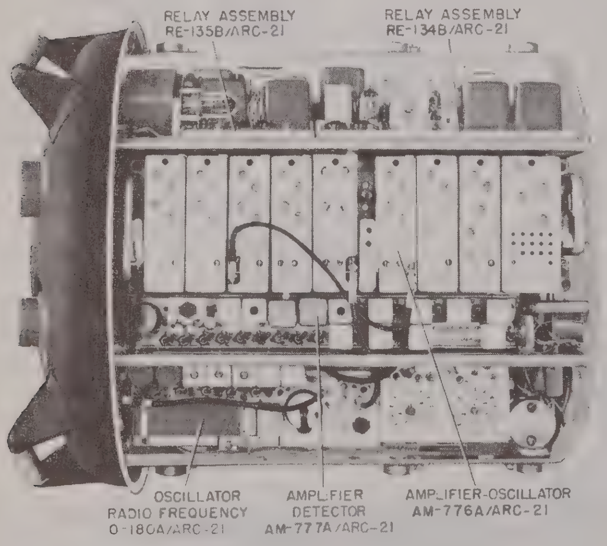

RELAY ASSEMBLY RE-135B/ARC-21
RELAY ASSEMBLY RE-134B/ARC-21
OSCILLATOR RADIO FREQUENCY O-180A/ARC-21
AMPLIFIER DETECTOR AM-777A/ARC-21
AMPLIFIER-OSCILLATOR AM-776A/ARC-21

Figure 6-6. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Bottom, Units in Place

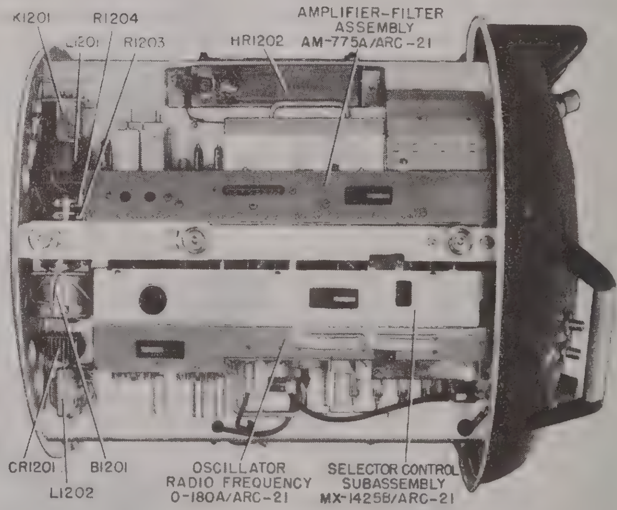

K1201
R1204
L1201
R1203
HR1202
AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21
CR1201
B1201
L1202
OSCILLATOR RADIO FREQUENCY O-180A/ARC-21
SELECTOR CONTROL SUBASSEMBLY MX-1425B/ARC-21

Figure 6-8. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Left Side, Units in Place

Perform the following checks to locate the trouble more accurately:

a. Check the chassis mounting screws to see that they are tight to insure good connections between chassis plugs and jacks. Check the various plugs and jacks for breakage and defective interconnecting cables.

b. Check each tube for heater glow. One tube with a defective heater will usually extinguish a "string" of tubes. Measuring by an ohmmeter will locate the defective tube heater or replacing one tube at a time will locate the defective tube by lighting the string. Do not replace tubes V101, V202, V205, V206, or V1001 as readjustments to the system may be required.

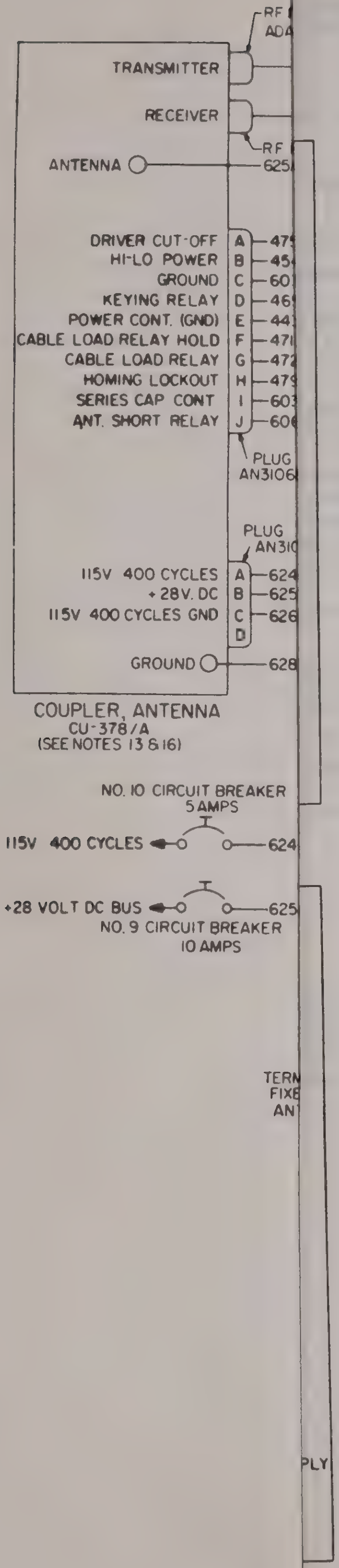
c. Replace the chassis with one known to be good. If the abnormal voltages still remain, use the procedures given in the following paragraphs to locate the trouble.

6-55. When the voltages are reasonably correct or when the "CONTROL" switch repeatedly trips to the "OFF" position, check each chassis in turn by substituting one known to be good. The following order of substitution is suggested:

a. Group 1: Change these chassis in the order given if initial frequency selection and receiver operation is abnormal.

Relay Assembly RE-134A/ARC-21

Amplifier-Filter Assembly AM-775A/ARC-21


RF
ADA
TRANSMITTER
RECEIVER
RF
ANTENNA
625
DRIVER CUT-OFF A 47
HI-LO POWER B 45
GROUND C 60
KEYING RELAY D 46
POWER CONT. (GND) E 44
CABLE LOAD RELAY HOLD F 47
CABLE LOAD RELAY G 47
HOMING LOCKOUT H 47
SERIES CAP CONT I 60
ANT. SHORT RELAY J 60
PLUG
AN3106
PLUG
AN31
115V 400 CYCLES A 624
+28V. DC B 625
115V 400 CYCLES GND C 626
D
GROUND 628
COUPLER, ANTENNA
CU-378/A
(SEE NOTES 13 & 16)
NO. 10 CIRCUIT BREAKER
5 AMPS
115V 400 CYCLES
624
+28 VOLT DC BUS
625
NO. 9 CIRCUIT BREAKER
10 AMPS
TERM
FIXE
AN
PLY

NOTES

1. RADIO SET AN/ARC-21 REQUIRES DYNAMOTOR ASSEMBLY DY-50/ARC-21. RADIO SET AN/ARC-21X REQUIRES POWER SUPPLY PP-298/ARC-21X. MAKE PROPER ALTERNATE CONNECTIONS AS SHOWN.
2. THE TEFLON INSULATED CABLE, WIRE NO. 623A, IS A COMMERCIAL PRODUCT AND SHALL BE EQUAL TO AND INTERCHANGEABLE WITH TYPE PFGL-10 AS MANUFACTURED BY THE BOSTON INSULATED WIRE & CABLE CO., BOSTON, MASS. OR WS-31/U PER SPEC. MIL-W-7500 THE LENGTH SHALL NOT EXCEED ONE (1) FOOT.
3. PINS J, K, & L OF PLUG AN3106E-28-11S ON COUPLER, ANTENNA CU-145/ARC ARE CONNECTED IN COMMON. ONE TO THREE WIRES, (NO. 600) FROM THE CIRCUIT BREAKER, ARE REQUIRED DEPENDING UPON THE LENGTH OF THE CABLE RUN.
5. WHEN COUPLER, ANTENNA CU-145/ARC IS INSTALLED, WIRES NO. 603B, 603C, 443E, 624A, 625A, 626A, 628A & CIRCUIT BREAKERS 9 & 10 MAY BE DELETED.
6. PLUGS, COMMERCIAL PRODUCT, SHALL BE EQUAL TO AND INTERCHANGEABLE WITH PLUGS TYPE NO. 97-3106-32-409P, 97-3106-28-426P AND 97-3106-28-426S AS MANUFACTURED BY AMERICAN PHENOLIC CORPORATION, CHICAGO 50, ILLINOIS. ALSO SEE NOTE 12.
7. RESISTOR SHALL BE IN ACCORDANCE WITH SPECIFICATION JAN-R-11 TYPE NO. RC20BE151K (150 OHMS).
8. DELETE WIRE SEGMENT 479C WHEN COUPLER, ANTENNA CU-378/A IS INSTALLED.
9. ON TERMINAL STRIP NO. 1 THE FOLLOWING TERMINALS ARE EFFECTED BY AN/ARA-26, TIE-IN OTHER THAN THOSE INDICATED: TERMINALS 9, 10 & 29.
10. WIRE SEGMENTS 465C, 478A, 478B & 435J ARE REQUIRED WHENEVER COUPLER, ANTENNA CU-305/U, CU-306/U, CU-307/U OR CU-308/U IS INSTALLED.
11. PLUG HHB C2336 REQUIRES STRAIGHT ADAPTER A3259 OR RIGHT ANGLE ADAPTER A3251 AND AN3057-20B.
    PLUG HHB C2338 REQUIRES STRAIGHT ADAPTER A3248 OR RIGHT ANGLE ADAPTER A3249 AND AN3057-16A OR B.
    PLUG HHB C2469 REQUIRES STRAIGHT ADAPTER A3248 OR RIGHT ANGLE ADAPTER A3249 AND AN3057-16A OR B
12. PLUGS AND ADAPTERS, COMMERCIAL PRODUCTS, SHALL BE EQUAL TO AND INTERCHANGEABLE WITH PLUGS NO. HHB C2336, HHB C2338 AND HHB C2469 AND ADAPTERS TYPE NO A3250, A3248, A3251 AND A3249 AS MANUFACTURED BY HH BUGGIE INC. TOLEDO 4, OHIO. ALSO SEE NOTES 6 & 11.
13. WHEN COUPLER ANTENNA CU-378/A IS INSTALLED WIRES NO. 466A, 467A, 468A, 469A, 470A, 600A, 600B, 600C, 473A, 435G, 474A & CIRCUIT BREAKER NO. 8 MAY BE DELETED.
14. THE MEASURED RESISTANCE OF CIRCUIT (438A & 438B) AND (438C & 438D) SHALL NOT EXCEED ONE-TENTH OF AN OHM.
15. FOR AIRCRAFT WITH INTEGRAL LIAISON ANTENNA DELETE RELAY, SOLENOID RE-132/ARC & WIRE NO. 603C. CONNECT WIRE NO. 606A FROM PIN-J TO PIN-I
16. OF PLUG AN 3106E-18-1S ON COUPLER ANTENNA CU-378/A.

REFERENCE U.S. AIR FORCE DRAWING NO. S52J2332.

9. Installation Diagram, Radio Set AN/ARC-21

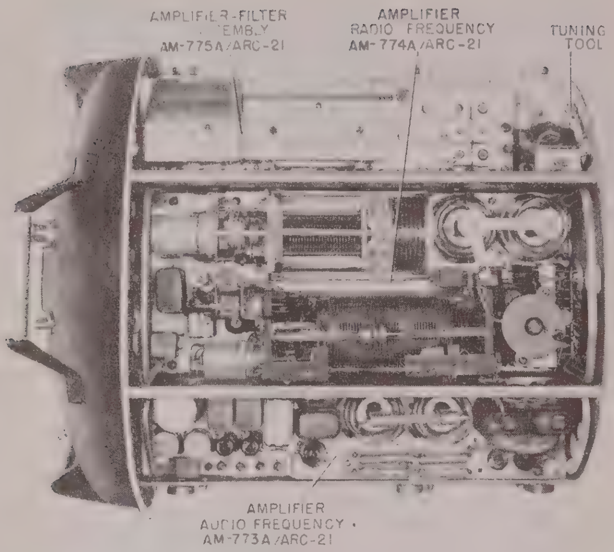

AMPLIFIER-FILTER
ASSEMBLY
AM-775A/ARC-21
AMPLIFIER
RADIO FREQUENCY
AM-774A/ARC-21
TUNING
TOOL
AMPLIFIER
AUDIO FREQUENCY
AM-773A/ARC-21

Figure 6-5. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Top, Units in Place

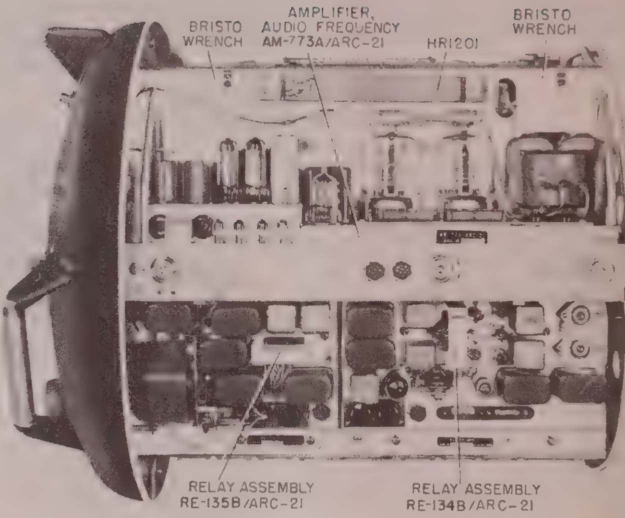

BRISTO
WRENCH
AMPLIFIER,
AUDIO FREQUENCY
AM-773A/ARC-21
HR1201
BRISTO
WRENCH
RELAY ASSEMBLY
RE-135B/ARC-21
RELAY ASSEMBLY
RE-134B/ARC-21

Figure 6-7. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Right Side, Units in Place

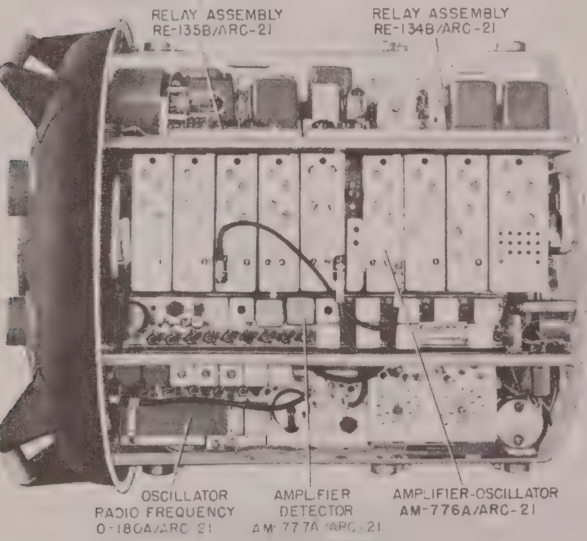

RELAY ASSEMBLY
RE-135B/ARC-21
RELAY ASSEMBLY
RE-134B/ARC-21
OSCILLATOR
RADIO FREQUENCY
O-180A/ARC-21
AMPLIFIER
DETECTOR
AM-777A/ARC-21
AMPLIFIER-OSCILLATOR
AM-776A/ARC-21

Figure 6-6. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Bottom, Units in Place

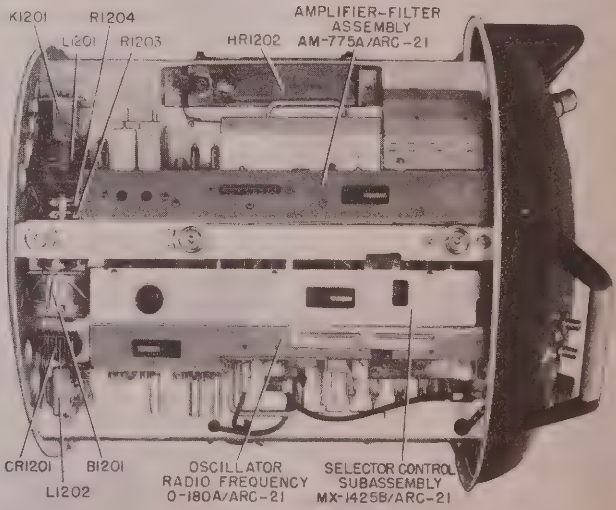

K1201
R1204
L1201
R1203
HR1202
AMPLIFIER-FILTER
ASSEMBLY
AM-775A/ARC-21
CR1201
L1202
B1201
OSCILLATOR
RADIO FREQUENCY
O-180A/ARC-21
SELECTOR CONTROL
SUBASSEMBLY
MX-1425B/ARC-21

Figure 6-8. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Left Side, Units in Place

Perform the following checks to locate the trouble more accurately:

a. Check the chassis mounting screws to see that they are tight to insure good connections between chassis plugs and jacks. Check the various plugs and jacks for breakage and defective interconnecting cables.

b. Check each tube for heater glow. One tube with a defective heater will usually extinguish a "string" of tubes. Measuring by an ohmmeter will locate the defective tube heater or replacing one tube at a time will locate the defective tube by lighting the string. Do not replace tubes V101, V202, V205, V206, or V1001 as readjustments to the system may be required.

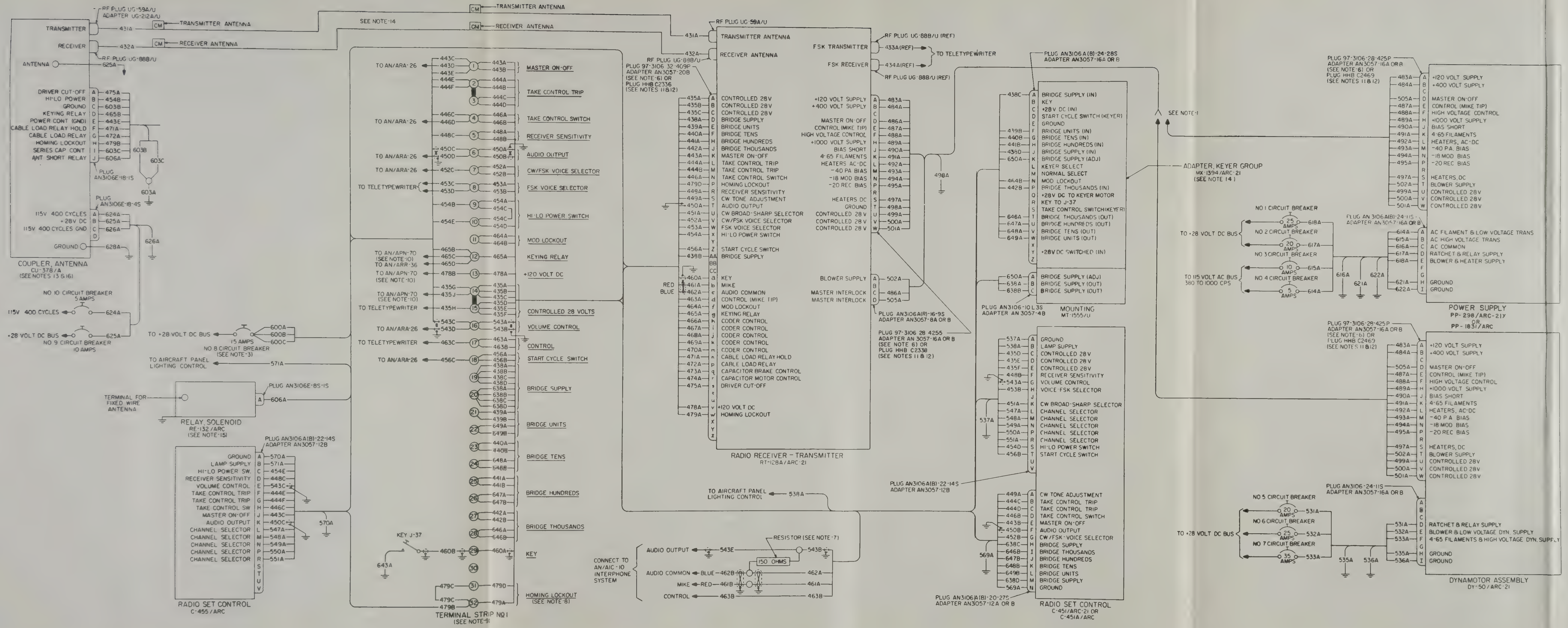
c. Replace the chassis with one known to be good. If the abnormal voltages still remain, use the procedures given in the following paragraphs to locate the trouble.

6-55. When the voltages are reasonably correct or when the "CONTROL" switch repeatedly trips to the "OFF" position, check each chassis in turn by substituting one known to be good. The following order of substitution is suggested:

a. Group 1: Change these chassis in the order given if initial frequency selection and receiver operation is abnormal.

Relay Assembly RE-134A/ARC-21

Amplifier-Filter Assembly AM-775A/ARC-21


COUPLER, ANTENNA
CU-378/A
(SEE NOTES 13 & 16)
TRANSMITTER ANTENNA
RECEIVER ANTENNA
SEE NOTE 14
RF PLUG UG-59A/U
ADAPTER UG-212A/U
RF PLUG UG-88B/U
PLUG AN3106E-18-1S
PLUG AN3106E-18-4S
NO 10 CIRCUIT BREAKER 5 AMPS
NO 9 CIRCUIT BREAKER 10 AMPS
115V 400 CYCLES
+28 VOLT DC BUS
NO 8 CIRCUIT BREAKER (SEE NOTE 3)
TO AIRCRAFT PANEL LIGHTING CONTROL
TERMINAL FOR FIXED WIRE ANTENNA
RELAY, SOLENOID
RE-132/ARC
(SEE NOTE 15)
PLUG AN3106E-8S-1S
PLUG AN3106A(B)-22-14S
ADAPTER AN3057-12B
RADIO SET CONTROL
C-455/ARC
TERMINAL STRIP NO 1
(SEE NOTE 9)
TO AN/ARA-26
TO AN/APN-70
TO AN/ARR-36
TO TELETYPEWRITER
MASTER ON-OFF
TAKE CONTROL TRIP
TAKE CONTROL SWITCH
RECEIVER SENSITIVITY
AUDIO OUTPUT
CW/FSK VOICE SELECTOR
FSK VOICE SELECTOR
HI-LO POWER SWITCH
MOD LOCKOUT
KEYING RELAY
+120 VOLT DC
CONTROLLED 28 VOLTS
VOLUME CONTROL
CONTROL
START CYCLE SWITCH
BRIDGE SUPPLY
BRIDGE UNITS
BRIDGE TENS
BRIDGE HUNDREDS
BRIDGE THOUSANDS
KEY
HOMING LOCKOUT (SEE NOTE 8)
KEY J-37
CONNECT TO AN/AIC-10 INTERPHONE SYSTEM
AUDIO OUTPUT
AUDIO COMMON
MIKE
CONTROL
RESISTOR (SEE NOTE 7)
150 OHMS
PLUG 97-3106-32-409P
ADAPTER AN3057-20B
PLUG HHB C2336
(SEE NOTES 11 & 12)
RADIO RECEIVER - TRANSMITTER
RT-128A/ARC-21
FSK TRANSMITTER
FSK RECEIVER
TO TELETYPEWRITER
PLUG AN3106A(R)-16-9S
ADAPTER AN3057-8A OR B
PLUG 97-3106-28-425S
ADAPTER AN3057-16A OR B
PLUG HHB C2338
TO AIRCRAFT PANEL LIGHTING CONTROL
PLUG AN3106A(B)-24-28S
ADAPTER AN3057-16A OR B
MOUNTING
MT-1555/U
PLUG AN3106-10L3S
ADAPTER AN3057-4B
ADAPTER, KEYER GROUP
MX-1394/ARC-21
(SEE NOTE 14)
PLUG AN3106A(B)-20-27S
ADAPTER AN3057-12A OR B
RADIO SET CONTROL
C-451/ARC-21 OR C-451A/ARC
SEE NOTE 1
TO +28 VOLT DC BUS
TO 115 VOLT AC BUS 380 TO 1000 CPS
NO 1 CIRCUIT BREAKER 25 AMPS
NO 2 CIRCUIT BREAKER 20 AMPS
NO 3 CIRCUIT BREAKER 10 AMPS
NO 4 CIRCUIT BREAKER 5 AMPS
PLUG 97-3106-28-425P
ADAPTER AN3057-16A OR B
PLUG HHB C2469
PLUG AN3106(B)-24-11S
ADAPTER AN3057-16A OR B
POWER SUPPLY
PP-298/ARC-21X
OR
PP-1831/ARC
NO 5 CIRCUIT BREAKER 20 AMPS
NO 6 CIRCUIT BREAKER 25 AMPS
NO 7 CIRCUIT BREAKER 35 AMPS
PLUG AN3106-24-11S
ADAPTER AN3057-16A OR B
DYNAMOTOR ASSEMBLY
DY-50/ARC-21

NOTES

1 RADIO SET AN/ARC-21 REQUIRES DYNAMOTOR ASSEMBLY DY-50/ARC-21 RADIO SET AN/ARC-21X REQUIRES POWER SUPPLY PP-298/ARC-21X MAKE PROPER ALTERNATE CONNECTIONS AS SHOWN

2 THE TEFLON INSULATED CABLE, WIRE NO 623A, IS A COMMERCIAL PRODUCT AND SHALL BE EQUAL TO AND INTERCHANGEABLE WITH TYPE PFGL-10 AS MANUFACTURED BY THE BOSTON INSULATED WIRE & CABLE CO, BOSTON, MASS OR WS-31/U PER SPEC MIL-W-7500 THE LENGTH SHALL NOT EXCEED ONE (1) FOOT

3 PINS J, K, & L OF PLUG AN3106E-28-11S ON COUPLER, ANTENNA CU-145/ARC ARE CONNECTED IN COMMON ONE TO THREE WIRES, (NO 600) FROM THE CIRCUIT BREAKER, ARE REQUIRED DEPENDING UPON THE LENGTH OF THE CABLE RUN

5 WHEN COUPLER, ANTENNA CU-145/ARC IS INSTALLED, WIRES NO 603B, 603C, 443E, 624A, 625A, 626A, 628A & CIRCUIT BREAKERS 9 & 10 MAY BE DELETED.

6 PLUGS, COMMERCIAL PRODUCT, SHALL BE EQUAL TO AND INTERCHANGEABLE WITH PLUGS TYPE NO 97-3106-32-409P, 97-3106-28-426P AND 97-3106-28-426S AS MANUFACTURED BY AMERICAN PHENOLIC CORPORATION, CHICAGO 50, ILLINOIS ALSO SEE NOTE 12

7 RESISTOR SHALL BE IN ACCORDANCE WITH SPECIFICATION JAN-R-11 TYPE NO RC20BE151K (150 OHMS)

8 DELETE WIRE SEGMENT 479C WHEN COUPLER, ANTENNA CU-378/A IS INSTALLED

9 ON TERMINAL STRIP NO 1 THE FOLLOWING TERMINALS ARE EFFECTED BY AN/ARA-26, TIE-IN OTHER THAN THOSE INDICATED TERMINALS 9, 10 & 29

10 WIRE SEGMENTS 465C, 478A, 478B & 435J ARE REQUIRED WHENEVER COUPLER, ANTENNA CU-305/U, CU-306/U, CU-307/U OR CU-308/U IS INSTALLED.

11 PLUG HHB C2336 REQUIRES STRAIGHT ADAPTER A3259 OR RIGHT ANGLE ADAPTER A3251 AND AN3057-20B
PLUG HHB C2338 REQUIRES STRAIGHT ADAPTER A3248 OR RIGHT ANGLE ADAPTER A3249 AND AN3057-16A OR B
PLUG HHB C2469 REQUIRES STRAIGHT ADAPTER A3248 OR RIGHT ANGLE ADAPTER A3249 AND AN3057-16A OR B

12 PLUGS AND ADAPTERS, COMMERCIAL PRODUCTS, SHALL BE EQUAL TO AND INTERCHANGEABLE WITH PLUGS NO HHB C2336, HHB C2338 AND HHB C2469 AND ADAPTERS TYPE NO A3250, A3248, A3251 AND A3249 AS MANUFACTURED BY HH BUGGIE INC TOLEDO 4, OHIO ALSO SEE NOTES 6 & 11

13 WHEN COUPLER ANTENNA CU-378/A IS INSTALLED WIRES NO. 466A, 467A, 468A, 469A, 470A, 600A, 600B, 600C, 473A, 435G, 474A & CIRCUIT BREAKER NO 8 MAY BE DELETED

14 THE MEASURED RESISTANCE OF CIRCUIT (438A & 438B) AND (438C & 438D) SHALL NOT EXCEED ONE-TENTH OF AN OHM

15 FOR AIRCRAFT WITH INTEGRAL LIAISON ANTENNA DELETE RELAY, SOLENOID RE 132/ARC & WIRE NO 603C. CONNECT WIRE NO 606A FROM PIN-J TO PIN-I

16 OF PLUG AN3106E-18-1S ON COUPLER ANTENNA CU-378/A.

REFERENCE U S AIR FORCE DRAWING NO S52J2332.

Figure 6-9. Installation Diagram, Radio Set AN/ARC-21

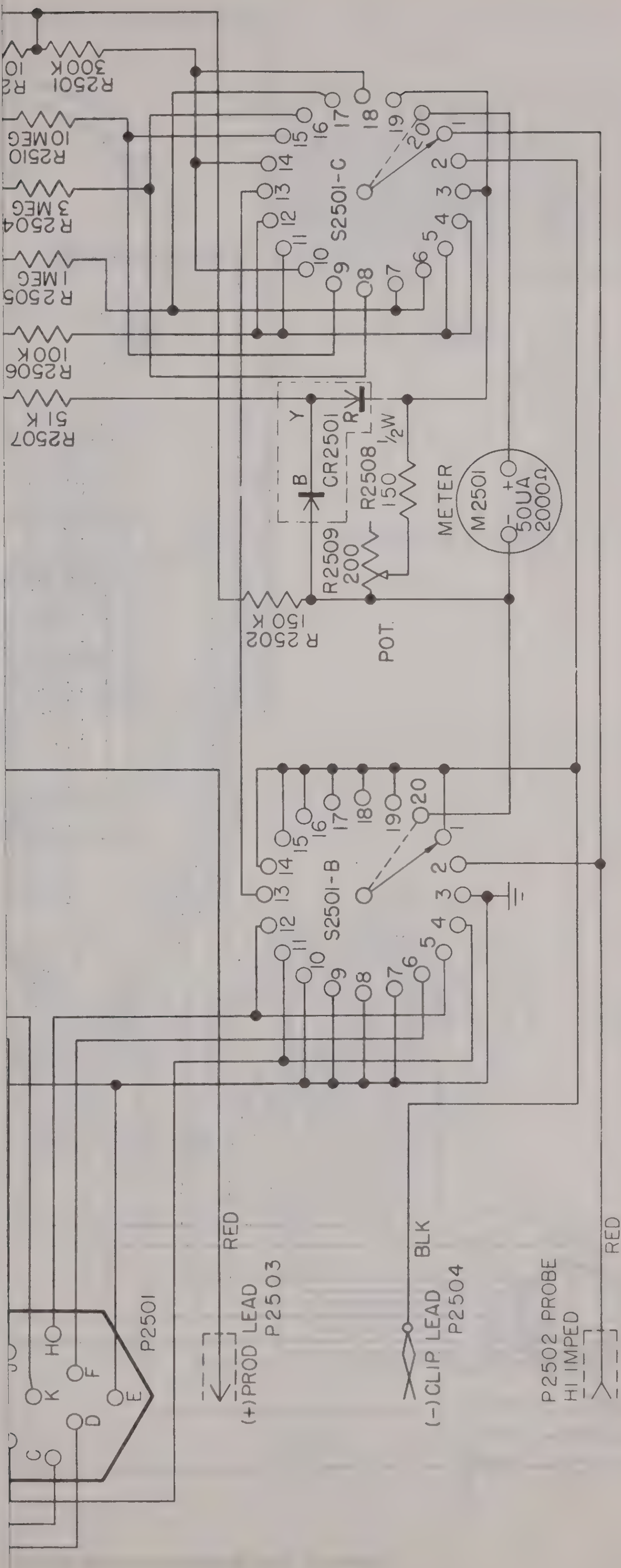

R2501
300K
R2510
10MEG
R2504
3 MEG
R2505
1 MEG
R2506
100K
R2507
51 K
S2501-C
CR2501
Y
B
R
L
R2508
150
½W
R2509
200
R2502
150 K
POT.
METER
M2501
50UA
2000Ω
S2501-B
RED
(+)PROD LEAD
P2503
BLK
(-)CLIP LEAD
P2504
P2502 PROBE
HI IMPED
RED
P2501
J
H
K
F
E
D
C

Figure 6-11. Multimeter ME-75/ARC-21, Schematic Diagram

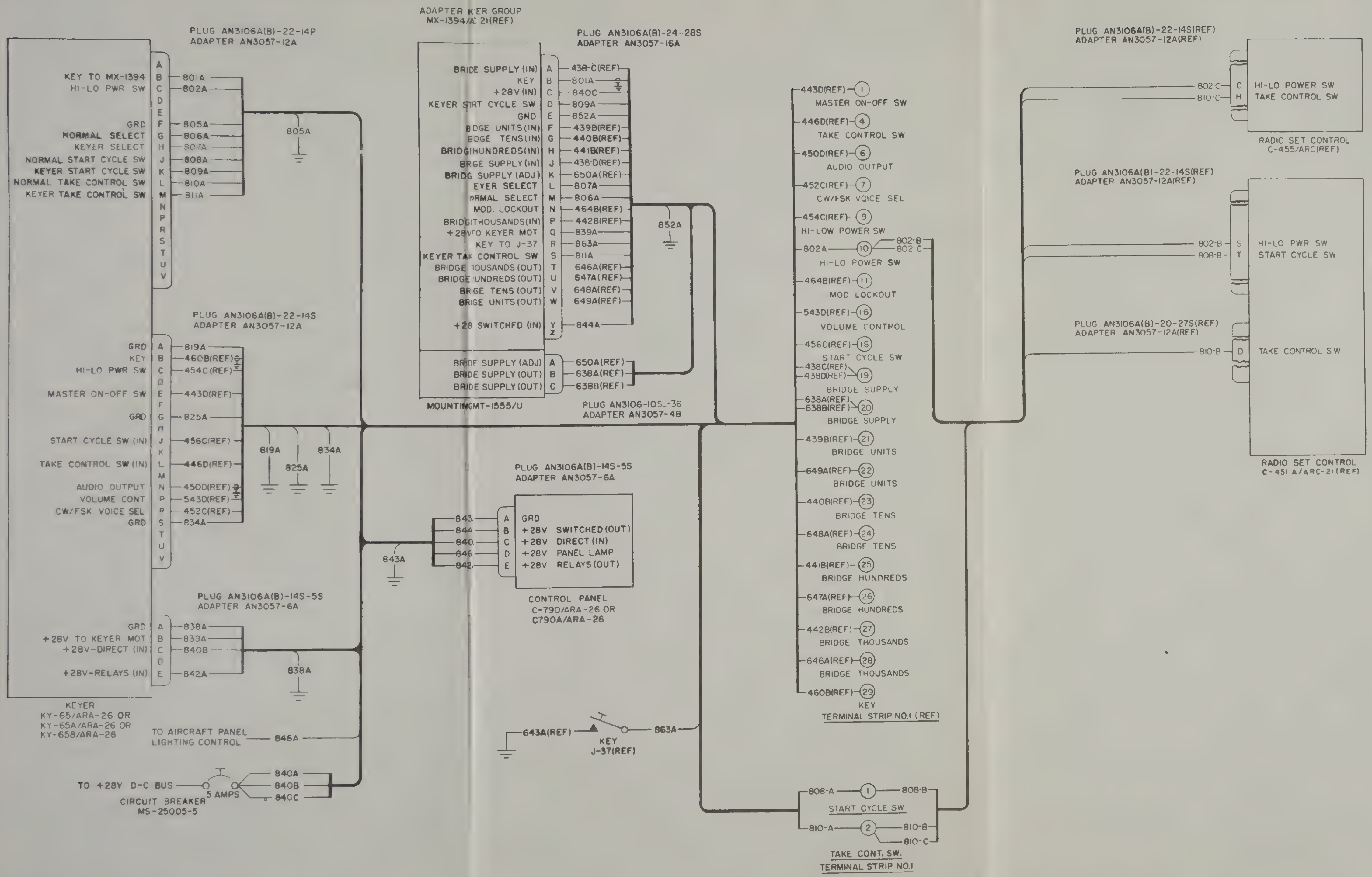
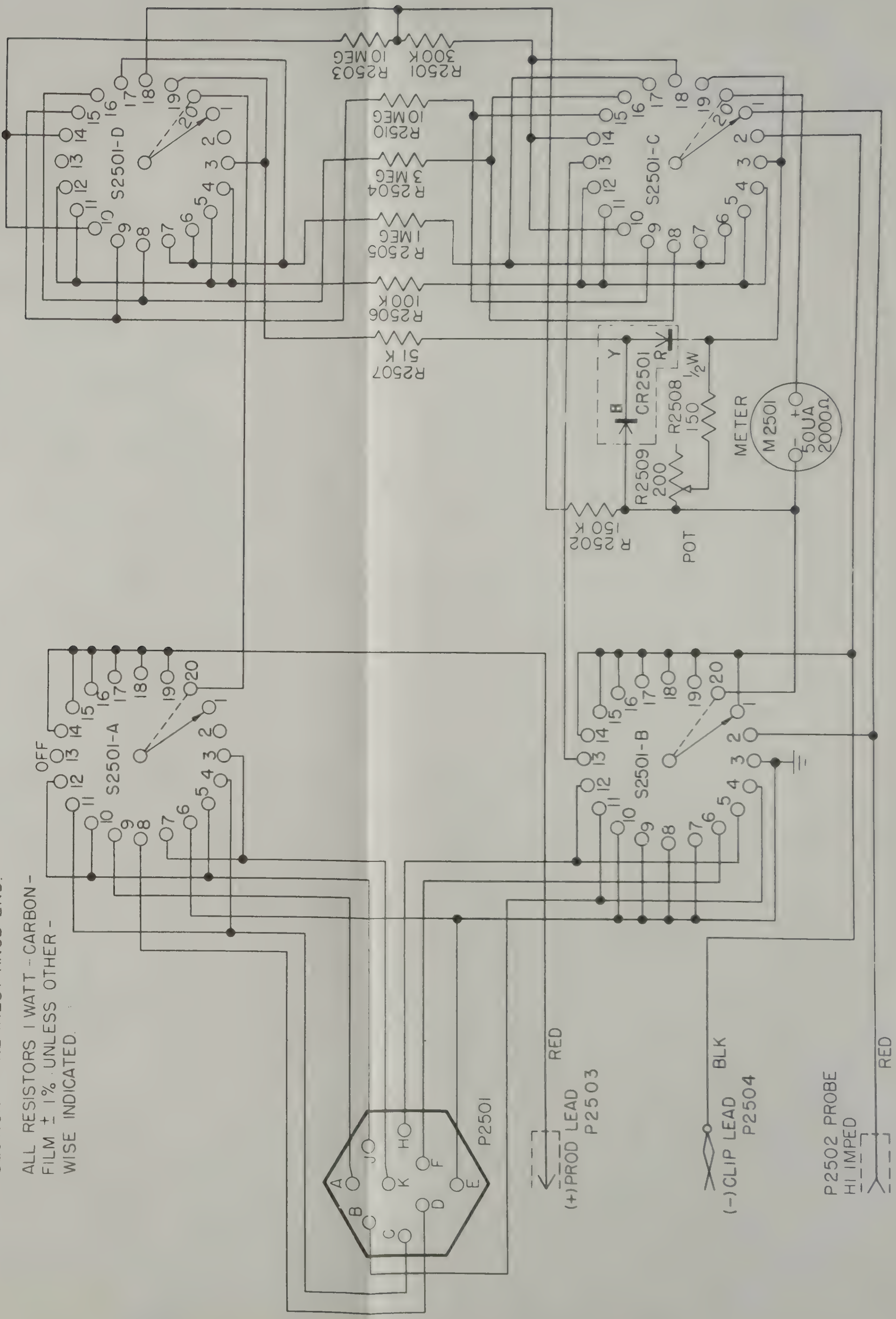

PLUG AN3106A(B)-22-14P
ADAPTER AN3057-12A
KEY TO MX-1394
HI-LO PWR SW
GRD
NORMAL SELECT
KEYER SELECT
NORMAL START CYCLE SW
KEYER START CYCLE SW
NORMAL TAKE CONTROL SW
KEYER TAKE CONTROL SW
801A
802A
805A
806A
807A
808A
809A
810A
811A
ADAPTER KEYER GROUP
MX-1394/ARC-21(REF)
PLUG AN3106A(B)-24-28S
ADAPTER AN3057-16A
BRIDGE SUPPLY (IN)
KEY
+28V (IN)
KEYER START CYCLE SW
GND
BRIDGE UNITS (IN)
BRIDGE TENS (IN)
BRIDGE HUNDREDS (IN)
BRIDGE SUPPLY (IN)
BRIDGE SUPPLY (ADJ)
KEYER SELECT
NORMAL SELECT
MOD. LOCKOUT
BRIDGE THOUSANDS (IN)
+28V TO KEYER MOT
KEY TO J-37
KEYER TAK CONTROL SW
BRIDGE THOUSANDS (OUT)
BRIDGE HUNDREDS (OUT)
BRIGE TENS (OUT)
BRIGE UNITS (OUT)
+28 SWITCHED (IN)
438-C(REF)
801A
840C
809A
852A
439B(REF)
440B(REF)
441B(REF)
438-D(REF)
650A(REF)
807A
806A
464B(REF)
442B(REF)
839A
863A
811A
646A(REF)
647A(REF)
648A(REF)
649A(REF)
844A
852A
BRIDE SUPPLY (ADJ)
BRIDE SUPPLY (OUT)
BRIDE SUPPLY (OUT)
650A(REF)
638A(REF)
638B(REF)
MOUNTING MT-1555/U
PLUG AN3106-10SL-3S
ADAPTER AN3057-4B
PLUG AN3106A(B)-22-14S
ADAPTER AN3057-12A
GRD
KEY
HI-LO PWR SW
MASTER ON-OFF SW
GRD
START CYCLE SW (IN)
TAKE CONTROL SW (IN)
AUDIO OUTPUT
VOLUME CONT
CW/FSK VOICE SEL
GRD
819A
460B(REF)
454C(REF)
443D(REF)
825A
456C(REF)
446D(REF)
450D(REF)
543D(REF)
452C(REF)
834A
819A
825A
834A
PLUG AN3106A(B)-14S-5S
ADAPTER AN3057-6A
843
844
840
846
842
GRD
+28V SWITCHED (OUT)
+28V DIRECT (IN)
+28V PANEL LAMP
+28V RELAYS (OUT)
843A
CONTROL PANEL
C-790/ARA-26 OR
C790A/ARA-26
PLUG AN3106A(B)-14S-5S
ADAPTER AN3057-6A
GRD
+28V TO KEYER MOT
+28V-DIRECT (IN)
+28V-RELAYS (IN)
838A
839A
840B
842A
838A
KEYER
KY-65/ARA-26 OR
KY-65A/ARA-26 OR
KY-65B/ARA-26
TO AIRCRAFT PANEL LIGHTING CONTROL
846A
TO +28V D-C BUS
5 AMPS
CIRCUIT BREAKER
MS-25005-5
840A
840B
840C
643A(REF)
KEY
J-37(REF)
863A
443D(REF) ① MASTER ON-OFF SW
446D(REF) ④ TAKE CONTROL SW
450D(REF) ⑥ AUDIO OUTPUT
452C(REF) ⑦ CW/FSK VOICE SEL
454C(REF) ⑨ HI-LOW POWER SW
802A ⑩ 802-B 802-C
HI-LO POWER SW
464B(REF) ⑪ MOD LOCKOUT
543D(REF) ⑯ VOLUME CONTROL
456C(REF) ⑱ START CYCLE SW
438C(REF) 438D(REF) ⑲ BRIDGE SUPPLY
638A(REF) 638B(REF) ⑳ BRIDGE SUPPLY
439B(REF) ㉑ BRIDGE UNITS
649A(REF) ㉒ BRIDGE UNITS
440B(REF) ㉓ BRIDGE TENS
648A(REF) ㉔ BRIDGE TENS
441B(REF) ㉕ BRIDGE HUNDREDS
647A(REF) ㉖ BRIDGE HUNDREDS
442B(REF) ㉗ BRIDGE THOUSANDS
646A(REF) ㉘ BRIDGE THOUSANDS
460B(REF) ㉙ KEY
TERMINAL STRIP NO.1 (REF)
808-A ① 808-B
START CYCLE SW
810-A ② 810-B 810-C
TAKE CONT. SW.
TERMINAL STRIP NO.1
PLUG AN3106A(B)-22-14S(REF)
ADAPTER AN3057-12A(REF)
802-C
810-C
HI-LO POWER SW
TAKE CONTROL SW
RADIO SET CONTROL
C-455/ARC(REF)
PLUG AN3106A(B)-22-14S(REF)
ADAPTER AN3057-12A(REF)
802-B
808-B
HI-LO PWR SW
START CYCLE SW
PLUG AN3106A(B)-20-27S(REF)
ADAPTER AN3057-12A(REF)
810-B
TAKE CONTROL SW
RADIO SET CONTROL
C-451 A/ARC-21 (REF)

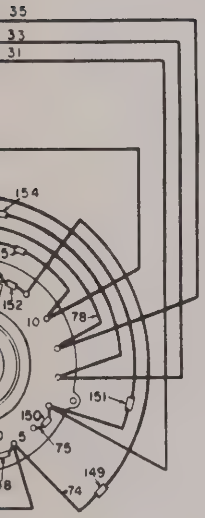
Figure 6-10. Installation Diagram, Emergency Keyer AN/ARA-26 with Radio Set AN/ARC-21


S2501-A
S2501-B
S2501-C
S2501-D
OFF
R2501 300K
R2502 150 K
R2503 10 MEG
R2504 3 MEG
R2505 1 MEG
R2506 100 K
R2507 51 K
R2508 150 1/2 W
R2509 200
POT
R2510 10 MEG
CR2501
Y
R
B
METER
M2501 50UA 2000Ω
P2501
A
B
C
D
E
F
H
J
K
RED
(+) PROD LEAD P2503
BLK
(−) CLIP LEAD P2504
P2502 PROBE HI IMPED
RED

NOTE:
SWITCH VIEWED FROM KNOB END IN "+ HI IMP" POSITION.
SECTION "A" NEAREST KNOB END.

ALL RESISTORS 1 WATT - CARBON-FILM ± 1% UNLESS OTHERWISE INDICATED.

Figure 6-11. Multimeter ME-75/ARC-21, Schematic Diagram


35
33
31
154
152
10
78
151
150
5
75
149
74

NOTES 1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS.

2 RESISTORS SHOWN ON E 2501 ARE TO BE ASSEM. ON FAR SIDE OF BOARD.

Selector Control Sub-assembly MX-1425B/ARC-21

Oscillator, Radio Frequency O-180A/ARC-21

Amplifier-Oscillator AM-776A/ARC-21

Amplifier-Detector AM-777A/ARC-21

b. Group 2: Change these chassis in the order given if transmitter is abnormal.

Relay Assembly RE-135B/ARC-21

Amplifier, Radio Frequency AM-774A/ARC-21

Amplifier, Audio Frequency AM-773A/ARC-21

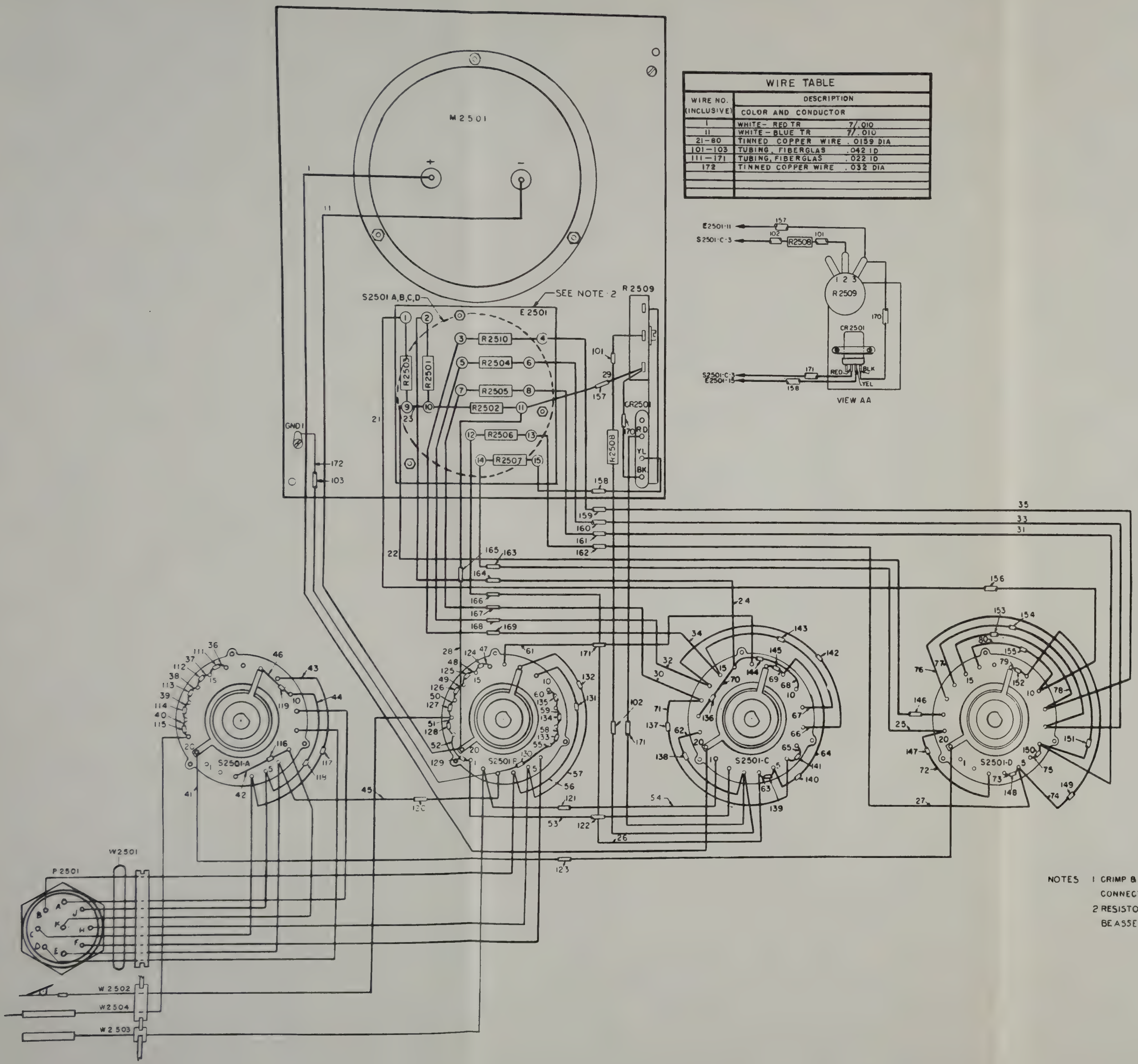
6-56. TRANSMITTER TROUBLE SHOOTING.

6-57. Check the grid drive of the power amplifier stage by plugging the Multimeter ME-75/ARC-21 plug into jack J403, major test point 3. Use meter position Plug MA-1. This will isolate the trouble to either the Amplifier, Radio Frequency AM-774A/ARC-21 or the Amplifier-Oscillator AM-776A/ARC-21. If the drive is satisfactory, the trouble is in the Amplifier, Radio Frequency AM-774A/ARC-21 or its associated circuits.

6-58. Very weak drive or no drive at all may be due to spring E401 not making contact with the plate caps of the push-push doubler tubes V512 and V513. The amplifier chassis must be removed to check this spring. Weak power amplifier tubes, V401 and V402, may give a low drive indication. All drive tests of the power amplifier stage must be made with the key or microphone "push-to-talk" button depressed since plate and screen voltages are removed from some exciter stages during reception periods.

6-59. If there is still no drive or the drive is very weak, check the voltages at jack J512, major test point 1, on the Amplifier-Oscillator AM-776A/ARC-21 chassis and compare these with the values given in the meter chart, figure 6-3. The tube heaters may be checked visually through a hole in the top of the individual boxes.

6-60. Set the multimeter switch to "PLUG VOLTS 5" and plug into jack J512, major test point 1, to check the B+120-volt supply. Set the multimeter switch to "DC." Plug the black lead into the "± VOLTS-MA-OHMS" jack and plug the red lead on the "400V" jack. The black lead goes to ground and the red lead to pin D of jack J512, major test point 1. The value is given in figure 6-3. Measure the screen grid voltage in a similar manner, except use pin A. The key must be down or the "push-to-talk" button pressed to make the reading. The screen voltage is controlled through the keying relay, K411, on the Amplifier, Radio Frequency AM-774A/ARC-21 chassis.


M2501
+
−
S2501 A,B,C,D
SEE NOTE 2
E2501
R2509
R2510
R2504
R2505
R2502
R2506
R2507
R2503
R2501
R2508
CR2501
RD
YL
BK
GND1
172
103
E2501-11
S2501-C-3
VIEW AA
RED
BLK
YEL
S2501-A
S2501-B
S2501-C
S2501-D
W2501
P2501
W2502
W2504
W2503
35
33
31
156
24
26
27
45
53
54

WIRE NO. (INCLUSIVE)	DESCRIPTION
	COLOR AND CONDUCTOR
1	WHITE- RED TR 7/.010
11	WHITE-BLUE TR 7/.010
21-80	TINNED COPPER WIRE .0159 DIA
101-103	TUBING, FIBERGLAS .042 ID
111-171	TUBING, FIBERGLAS .022 ID
172	TINNED COPPER WIRE .032 DIA

NOTES 1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS.
2 RESISTORS SHOWN ON E 2501 ARE TO BE ASSEM. ON FAR SIDE OF BOARD.

Figure 6-12. Multimeter ME-75/ARC-21, Connection Diagram

Selector Control Sub-assembly MX-1425B/ARC-21

Oscillator, Radio Frequency O-180A/ARC-21

Amplifier-Oscillator AM-776A/ARC-21

Amplifier-Detector AM-777A/ARC-21

b. Group 2: Change these chassis in the order given if transmitter is abnormal.

Relay Assembly RE-135B/ARC-21

Amplifier, Radio Frequency AM-774A/ARC-21

Amplifier, Audio Frequency AM-773A/ARC-21

6-56. TRANSMITTER TROUBLE SHOOTING.

6-57. Check the grid drive of the power amplifier stage by plugging the Multimeter ME-75/ARC-21 plug into jack J403, major test point 3. Use meter position Plug MA-1. This will isolate the trouble to either the Amplifier, Radio Frequency AM-774A/ARC-21 or the Amplifier-Oscillator AM-776A/ARC-21. If the drive is satisfactory, the trouble is in the Amplifier, Radio Frequency AM-774A/ARC-21 or its associated circuits.

6-58. Very weak drive or no drive at all may be due to spring E401 not making contact with the plate caps of the push-push doubler tubes V512 and V513. The amplifier chassis must be removed to check this spring. Weak power amplifier tubes, V401 and V402, may give a low drive indication. All drive tests of the power amplifier stage must be made with the key or microphone "push-to-talk" button depressed since plate and screen voltages are removed from some exciter stages during reception periods.

6-59. If there is still no drive or the drive is very weak, check the voltages at jack J512, major test point 1, on the Amplifier-Oscillator AM-776A/ARC-21 chassis and compare these with the values given in the meter chart, figure 6-3. The tube heaters may be checked visually through a hole in the top of the individual boxes.

6-60. Set the multimeter switch to "PLUG VOLTS 5" and plug into jack J512, major test point 1, to check the B+120-volt supply. Set the multimeter switch to "DC." Plug the black lead into the "± VOLTS-MA-OHMS" jack and plug the red lead on the "400V" jack. The black lead goes to ground and the red lead to pin D of jack J512, major test point 1. The value is given in figure 6-3. Measure the screen grid voltage in a similar manner, except use pin A. The key must be down or the "push-to-talk" button pressed to make the reading. The screen voltage is controlled through the keying relay, K411, on the Amplifier, Radio Frequency AM-774A/ARC-21 chassis.

SECTION VII

MAINTENANCE INSTRUCTIONS FOR AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

7-1. TROUBLE ANALYSIS.

7-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

7-3. The first step in servicing a defective unit is to clean and examine it carefully for visible signs of distress or damage. Check any circuit components that show signs of overheating for designated values by reference to the schematic diagram, figure 7-4.

7-4. With any obvious defects corrected, connect the chassis into the test setup by means of patch cables and perform the checks given in table XXIX.

7-5. Table XXX gives resistance values from plug P101 to ground when disconnected from the system.

7-6. Steps 1 and 8 of table XXIX are checks on the functioning of the circuits for audio amplification. If these indications are low, adjust gain control R107 to increase gain, using Oscilloscope OS-8/U to indicate 90 percent modulation. Should maximum setting of R107 fail to give indications approximately correct, defective tubes or coupling circuits are indicated. Check tubes by means of Tube Tester TV-7/U or I-177 or by replacing with tubes known to be good. Defective circuit components may be located by employing the stage gain chart, table XXXI, and the voltage and resistance charts, tables XXXII and XXXIII. Refer to figure 7-1 for tube locations.

7-7. CIRCUIT ANALYSIS.

7-8. The Amplifier, Audio Frequency AM-773A/ARC-21 performs a dual function. Operating as a modulator, it clips for automatic gain control into the modulator tubes, amplifies, and impresses the a-f modulating signal on the r-f carrier for voice transmission. In servo-operation, a d-c error signal passes through a rate network, is chopped into pulsating dc, amplified, and fed into the main amplifier. The output is rectified mechanically, and fed to clutches on the power amplifier through polarizing rectifiers, for transmitter tank tuning. The rate network, consisting of resistors R136 and R137, and capacitor C118 anticipates the zero error point and thus helps to prevent mechanical oscillation due to the mechanical mass of inductor L-403. The values are carefully chosen.

7-9. The high-low power relays K101 and K104 are energized only during low-power operation. This can be set up on Radio Set Control C-451A/ARC-21 by setting the "POWER" switch to "LOW" or one of the aneroid switches located in the ERA Coupler and the Chassis, Receiver-Transmitter MX-1424A/ARC-21. When relay K101 is energized, contacts 8 and 14 increase the audio attenuation between tubes V101 and V102: contacts 6 and 7, ground pin J of plug P101. Contacts 4 and 5 short out resistor R147 and the now open contacts 3 and 5 increase the gain of tube V109. Contacts 12 and 2 switch a different voltage to pin N of plug P101.

7-10. Relays K103 and K105 are the tune-operate relays and are energized only after the transmitter and coupler tuning is completed and during transmission periods. When relay K103 is not energized, the Amplifier, Audio Frequency AM-773A/ARC-21 operates as a servo amplifier. In addition the control grids of the modulator tubes, V105 and V106, are connected together and to the bias supply. This occurs through contacts 9, 14, 13, and 7. Contacts 3 and 5 of relay K103 apply the 27.5-volt d-c supply to pin F of plug P101 and the vibrator Y101, energizing it. Contacts 11 and 2 of relay K103 apply +120 volts dc to the plate circuit of tube V109 and cutoff bias to the first triode section of tube V102.

7-11. When relays K103 and K105 are energized they set up the Amplifier, Audio Frequency AM-773A/ARC-21 to operate as a modulator. In this case the control grids of tubes V105 and V106 are connected to the modulator driver winding of transformer T102 (terminals 4 and 6). This is accomplished through contacts 6, 7, 8 and 14 of relay K103. Contacts 4 and 5 apply cutoff bias to the second section of the tube V102. Contacts 12 and 2 apply 120 volts dc to pin V of plug P101 while the 120 volts dc and cutoff bias are removed from tube V109 and the first triode of tube V102, respectively.

7-12. Relay K104 switches the power amplifier plate return circuit between the 1000-volt and 400-volt sources. This circuit enters at plug P103, thence through terminals 4 and 5 of transformer T103, resistor R142, contacts 8 and 1 of relay K107.

7-13. When relay K105 is energized, contacts 3 and 4 insert resistors R127 and R129 in series with the coil, terminals 2 and 3 of relay K107, to reduce the current transmission when the relay is inoperative. When relay K105 is energized, contacts 2 and 3 remove the current from the coil, terminals 1 and 8 of relay K107 are shorted.

7-14. Resistors R145, R146, R147, and R148 control the current flowing through the coil of relay K107 marked by terminals 2 and 3.

7-15. Relay K107 controls the direction of rotation of the power amplifier loading capacitor, C430. The relay is controlled by the value of the power amplifier plate current.

TABLE XXIX. TROUBLE ANALYSIS, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 7-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Circuit Under Test
1	4 (J101)	Plug Multimeter ME-75/ARC-21 into jack J101. Set selector switch at position "MA2"	Radio Set Control C-451A/ARC-21 set for "VOICE" operation. "POWER" at "HI", control at "ON." Press microphone button for transmit and wait for tune-up before modulating	0 no signal 20 ma max. signal transmit	Grid current on modulator tubes V105, V106
2	4 (J101)	Selector switch at position 3	Press microphone button	400 volts	400-volt transmitter supply
3	4 (J101)	Selector switch at position 4	Press microphone button	300 volts transmit	Plate voltage on driver, V104
4	4 (J101)	Selector switch at position 5	Same as step 1	+ 120 volts transmit	Plate voltage on clipper V101 present only after completion of transmitter and coupler tuning
5	4 (J101)	Selector switch at position 6. When using PP-298/ARC-21X, use position 10	"CONTROL" is "ON." Press microphone button	13.5 volts	Midtap of heater string using V109
6	4 (J101)	Selector switch at position 7	Press microphone button	- 18 volts transmit	Bias on modulator tubes V105, V106
7	5 (J102)	Transfer test meter plug to J102. Selector switch at position 1	1. Same as step 1 2. Same as step 1 but move "POWER" switch to "LOW"	1. 220 ma transmit 2. 70 ma transmit	Power amplifier plate current
8	5 (J102)	Selector switch to position 2	1. Same as step 1 2. Same as step 1 "POWER" switch at "LOW"	40 ma no signal 220 ma max. signal 80 ma nominal signal	Modulator plate current
9	5 (J102)	Selector switch at position 3	1. Same as step 1 2. Same as step 1 "POWER" switch at "LOW"	1000 volts transmit 300 volts transmit	Power amplifier plate voltage

TABLE XXX. RESISTANCE IN OHMS, FROM PLUG, P101 TO GROUND, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

Pin	A	B	C	D	E	F	H	J	K	L
Reading	†	†	13.5	†	†	125	†	†	0	0
Pin	M	N	P	R	S	T	U	V	W	X
Reading	200	900*	125	125	†	†	†	†	185	38,000
Pin	Y	Z	AA	BB	CC	DD	EE	FF	HH	JJ
Reading	†	†	1 meg	520	†	†	58,000**	†	†	†
Pin	KK	LL	MM	NN						
Reading	†	100k	†	†						

*Varies with setting of resistor R106.
**Varies with tap setting on resistor R155.
† Infinite resistance value.

TABLE XXXI. VOLTAGE GAIN PER STAGE, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

Apply 0.3 volt to pins A&B of plug P101. Gain control R107 at max.
Use Voltmeter TS-375/U with a-c probe coupled through 0.1 uf capacitor at points given in table.

Power	Tube	1	2	3	4	5	6	7	8	9
"HI"	V101				0.98	0.9				
	V102		0.90							
	V103		5.75							
	V104	71	5.3					5.5		70
	V105				44					
	V106				44					
"LOW"	V101				0.95	0.9				
	V102		0.2							
	V103		1.45							
	V104	22.5	1.325					1.325		22.5
	V105				13					
	V106				12.5					

TABLE XXXII. VOLTAGE CHART, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Multimeter TS-352/U.
Test Conditions: A - Dormant, not keyed. B - Low power. C - Keyed high power.

Tube			Pin Number								
Symbol	Type	Condition	1	2	3	4	5	6	7	8	9
		A	-0.2	-0.2	6.7	0	0	13.8	-0.2	0.2	-
V101	-6021	B	16	16	6.9	16	15.8	14	16	16	-
		C	14	14	6.25	14.0	14.0	12.5	14	14	-
		A	54	0	13.8	4.2	1.4	21	0	54	-
V102	-6021	B	62.5	0	14.0	1.45	26.2	20.8	0	62.5	-
		C	60	0	13	1.35	23.5	20	0	60	-
		A	79	31	21	37	37	26.5	0.03	79	-
V103	-6021	B	80	30	20.5	39.0	39.0	27.2	0	80	-
		C	78	31	20.0	37.0	37.0	26	0	78	-
		A	-0.28	-1.4	0.02	25.75	12.25	0	-1.4	19.1	-
V104	-5687	B	295	0	17.2	26.2	13.0	17.2	0	19.5	295
		C	275	0	17.0	26.0	12.8	17.0	0	12.2	275

TABLE XXXII. VOLTAGE CHART, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21 (cont)

Tube			Pin Number								
Symbol	Type	Condition	1	2	3	4	5	6	7	8	9
V105	-4-65A	A	-	-	-	-	-	-	-	-	-
		B	26.2	250	19	19	0	250	20	-	-
		C	26.0	250	21.2	21.2	0	250	19.8	-	-
V106	-4-65A	A	-	-	-	-	-	-	-	-	-
		B	14	250	290	-19	0	250	19	-	-
		C	14	250	390	-20	0	250	19.8	-	-
V107	-0A2	A	-0.22	-	-	0	-0.25	-	-	-	-
		B	250	107	80	107	250	90	107	-	-
		C	250	107.5	75	107.5	250	90	107.5	-	-
V108	-0B2	A	0	-	-	-	-	-	0	-	-
		B	107	0	0	0	107	0	0	-	-
		C	107.5	0	0	0	107.5	0	0	-	-
V109	-6021	A	63	0	0	1.95	1.92	6.8	0	63	-
		B	0.33	-0.74	0	0	0	6.9	-0.4	0.33	-
		C	0.33	-0.69	0	0	0	6.2	-0.4	0.33	-

TABLE XXXIII. RESISTANCE CHART, AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

All resistances in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Test Conditions: Chassis on bench all cables and connections removed.

Tube		Pin Number								
Symbol	Type	1	2	3	4	5	6	7	8	9
V101	-6021	†	†	3.5	120k	150k	7	†	†	
V102	-6021	300k	45k*	7	8k	7k	10	470k	300k	
V103	-6021	100k	5 meg	10	60k	60k	13	5 meg	100k	
V104	-5687	105k	120k	680	†	†	680	120k	†	105k
V105	-4-65A	130	105k	†	†	†	†	130		
V106	-4-65A	130	105k	95k	†	4k**	105k	130		
V107	-0A2	105k	†	†	†	105k	†	†		
V108	-0B2	†	†	†	†	†	†	0		
V109	-6021	270k	650k	0	680	680	3.5	650k	270k	

*Varies with setting of resistor R107.
**Varies with tap setting on resistor R154.
† Infinite resistance value.

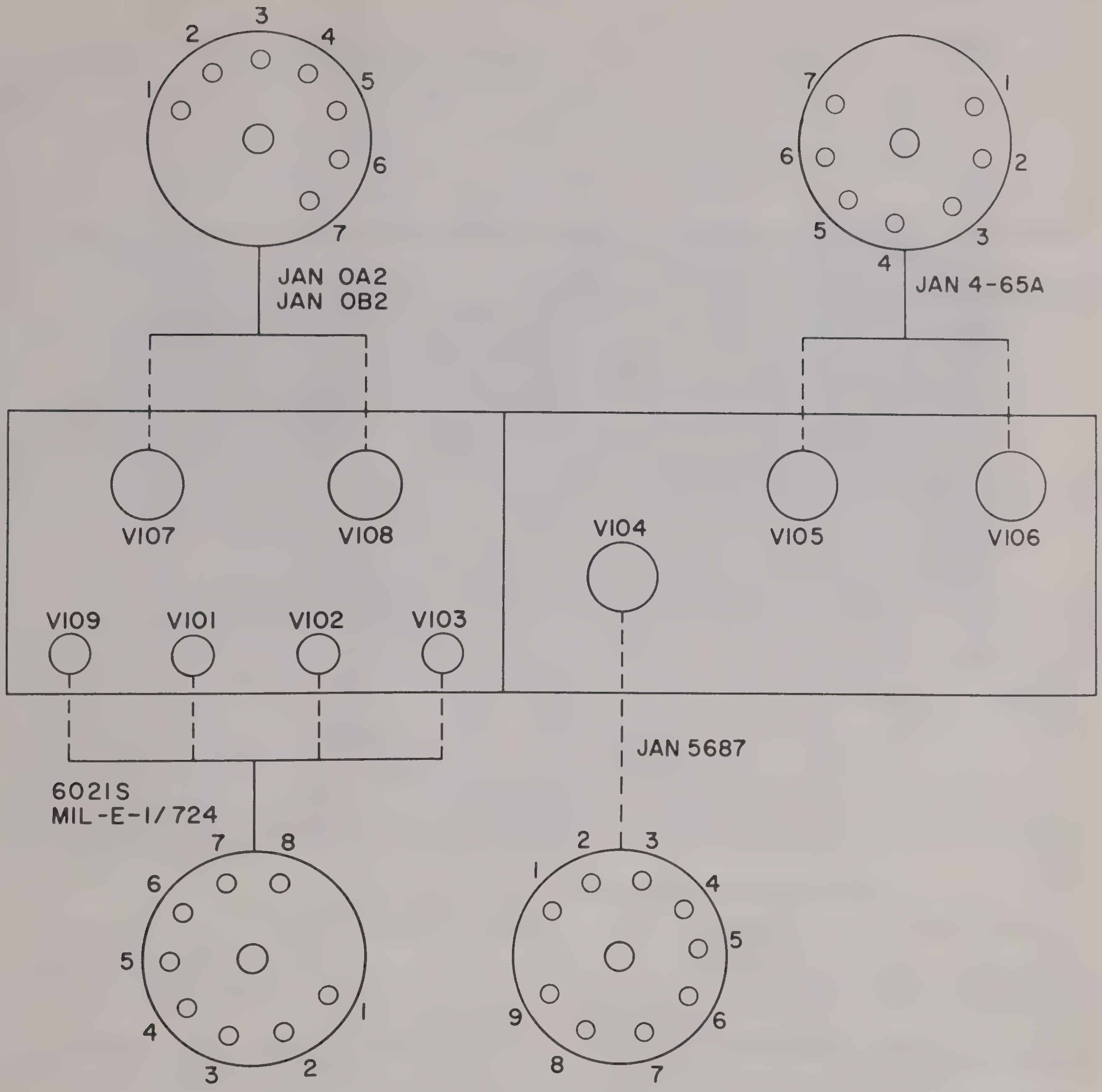

1
2
3
4
5
6
7
JAN OA2
JAN OB2
7
1
6
2
5
3
4
JAN 4-65A
V107
V108
V104
V105
V106
V109
V101
V102
V103
JAN 5687
6021S
MIL-E-1/724
7
8
6
5
4
3
2
1
2
3
1
4
5
9
6
8
7

Figure 7-1. Amplifier, Audio Frequency AM-773A/ARC-21, Tube Location

TABLE XXXIV. MAINTENANCE CHECK LIST FOR AMPLIFIER, AUDIO FREQUENCY AM-773A/ARC-21

I. VISUAL INSPECTION	
UNIT	CHECK FOR
Chassis, Components	Dents, cracks, bent fins, corrosion, stripped threads, dirt, dust, discoloration, burned or deteriorated insulation

II. ADJUSTMENT		IN			OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal IN	Test Equipment	Test Point	Signal OUT	Remarks
1. Servo Amplification Adjustment	7-19	Transmitter tuning			ME-75/ ARC-21	J102	220 ma (High Power) 70 ma (low power)	Adjust R105, R106, R137 for smooth operation of Amplifier, Radio Frequency AM-774A/ARC-21
2. Servo Control Adjustment	7-21							Adjust R137 for least mechanical oscillation of tuning mechanism
3. Modulation Level Adjustment	7-23	TS-382/U	Junction Box Terms. 28 & 29	6 v 1000 cps	OS-8/U	Antenna	100% modulated envelope	Adjust modulator gain control for proper indication

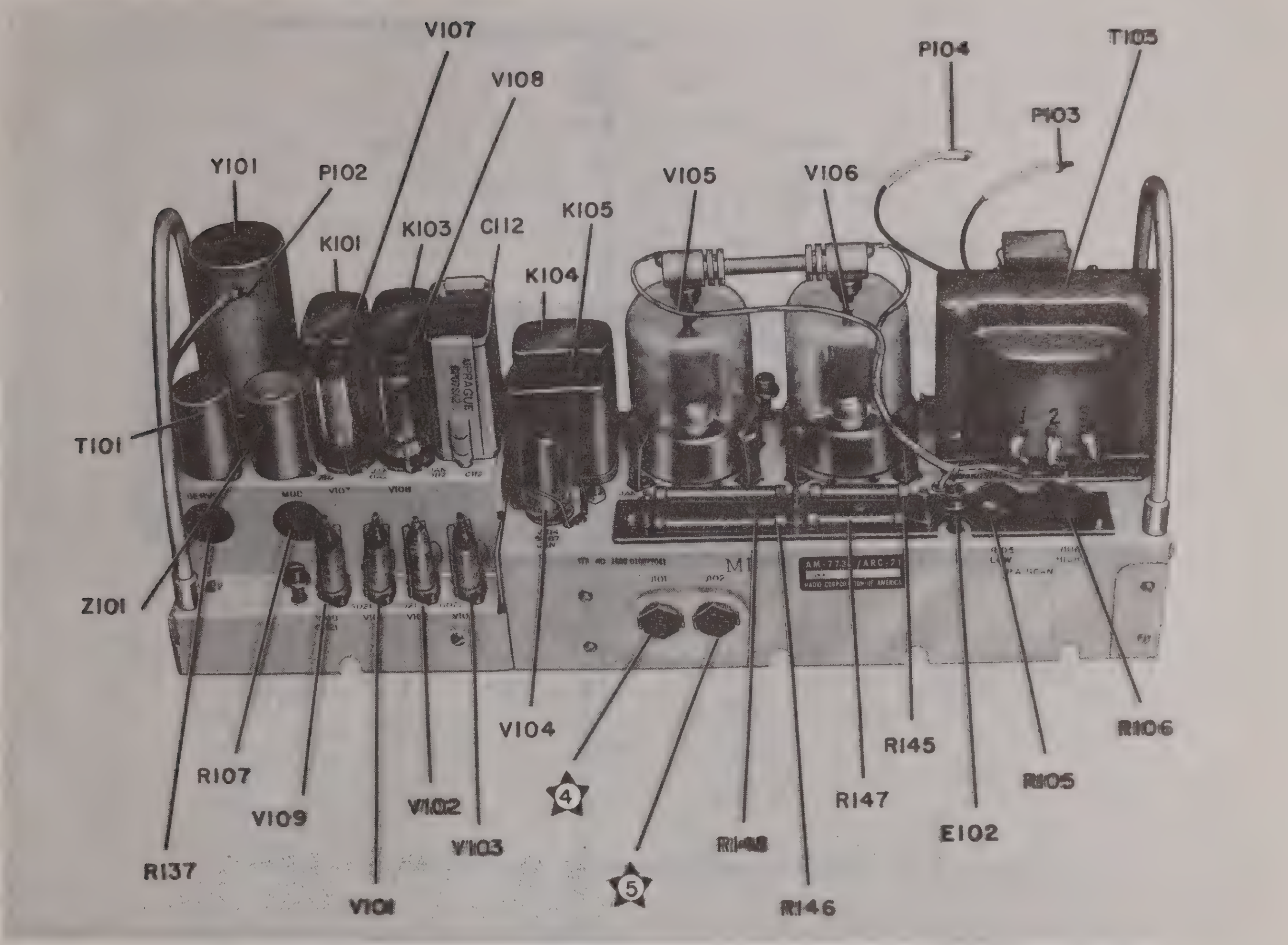


Figure 7-2. Amplifier, Audio Frequency AM-773A/ARC-21, Top

7-16. ADJUSTMENT AND CHECKS.

7-17. GENERAL. Paragraphs 7-19 and 7-23 describe procedures for adjustments and check of servo amplification and modulation level.

7-18. Table XXXIV is a maintenance check list summarizing maintenance procedures for this component. It lists procedures, indications, and tests that will assure field maintenance personnel that the Amplifier, Audio Frequency AM-773A/ARC-21 meets minimum standards of performance. Table XXXIV may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

7-19. SERVO AMPLIFICATION CHECK AND ADJUSTMENT.

7-20. The previous checks will have located all defects in the circuits except trouble in the servo preamplifier V104 and vibrator Y101 which are used exclusively in servo amplifier functioning. Check servo operation as follows:

a. Set controls on Radio Set Control C-451A/ARC-21 for "VOICE" operation, "POWER" at "HI" and "CONTROL" to "ON."

b. Plug Multimeter ME-75/ARC-21 into major test point 5, test jack J102, and set selector switch to position 1.

c. Set servo gain control R137 fully clockwise.

d. Set "HI" scan control R106 at mid-point.

e. Observe the Amplifier, Radio Frequency AM-774A/ARC-21 mechanism and depress microphone switch. The coil roller will advance up the coil and the transmitter will start to tune and load as indicated by operation of loading motor and variations in the plate current indication on the meter.

f. Adjust R106 to a position where tuning occurs consistently each time the channel frequency is changed and the microphone button depressed. If R106 is set too high, the tuning cycle will start but never be completed, the roller returning to home position. Reset resistor R106 until tuning is completed each time tuning cycle is started. When correctly tuned and loaded the plate current on the meter should be 220 ma in high power and 70 ma in low power.

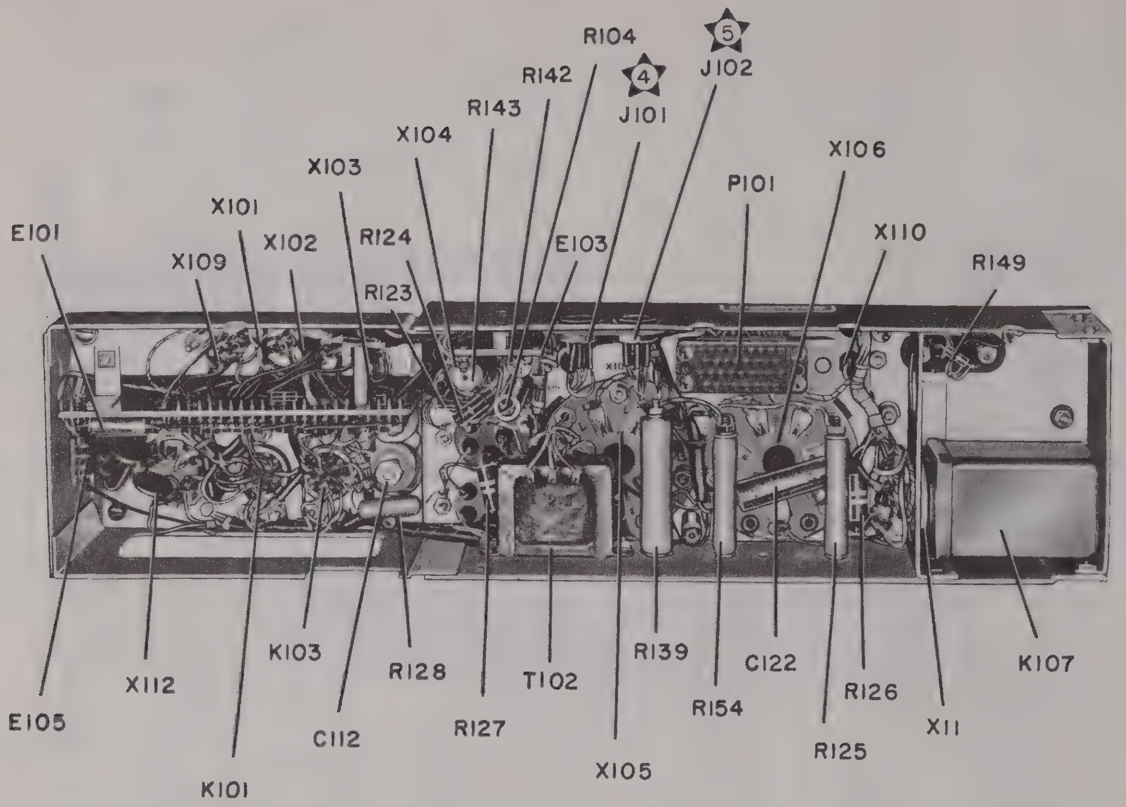


Figure 7-3. Amplifier, Audio Frequency AM-773A/ARC-21, Bottom

NOTE

If resistor R106 is set too high, the coil roller may be too far from resonance when servo tuning starts. This may so restrict the mechanical power of the system that the coil roller will either stop prior to the loading cycle or scan back to the home position and result in a failure to tune. After tuning cycle is functioning properly, check tuning in each of the four bands by loosely coupling a Frequency Meter FR-47/U to output of the transmitter and checking output against channel switch setting.

g. Set channel frequency for 23.9995 mc.
h. Press microphone button to initiate tuning cycle. If tuning does not proceed smoothly, reduce gain setting of resistor R137 slightly.
i. Set "POWER" control on Radio Set Control C-451A/ARC-21 to "LOW."
j. Repeat steps e and f, adjusting "LOW" scan control R105 in the same manner as R106.

7-21. ADJUSTMENT OF SERVO GAIN CONTROL R137.

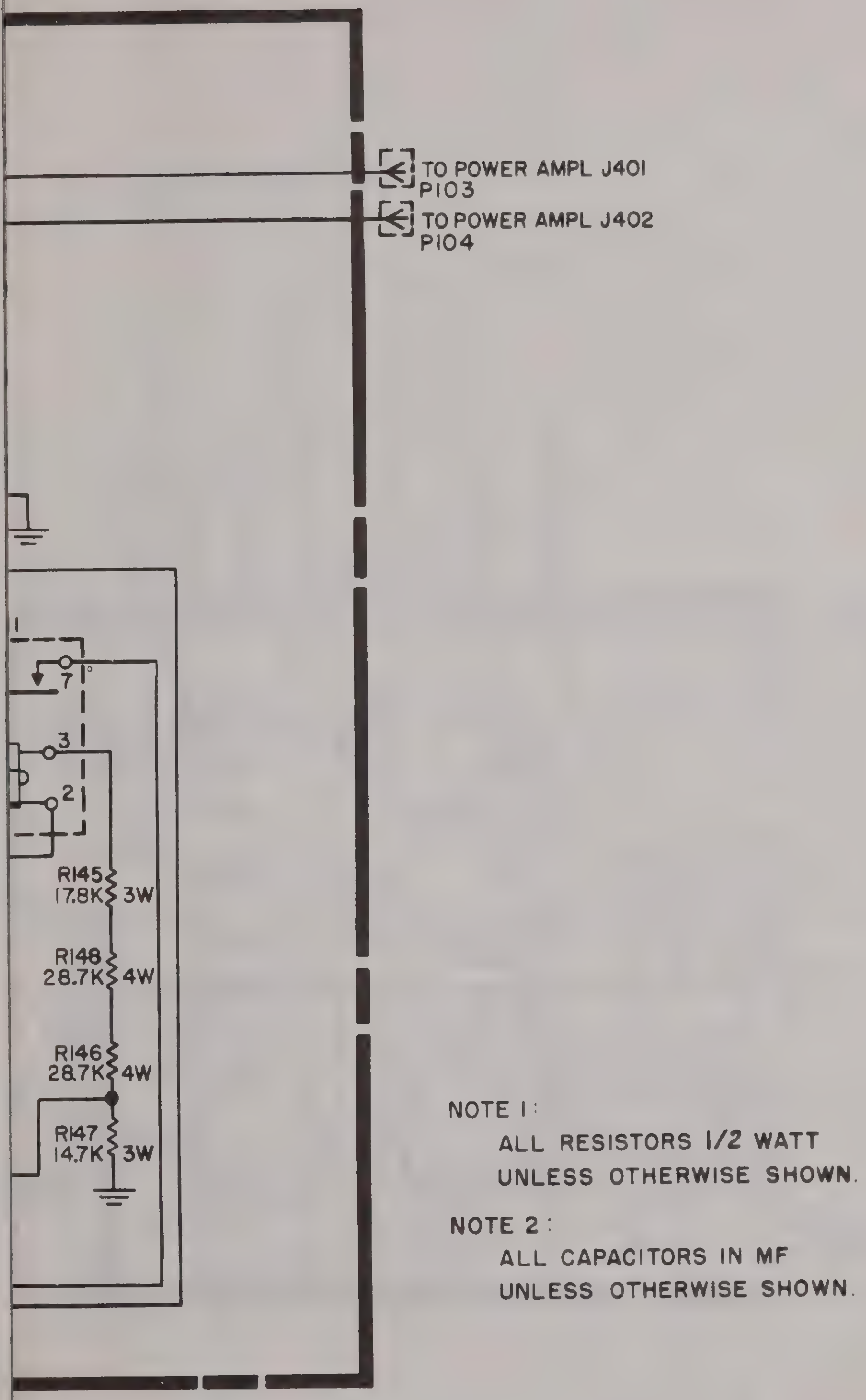
7-22. Use the following procedure to set the servo gain control R137:

a. Set it to the three-quarter maximum clockwise position.
b. Set up a frequency of 20 megacycles in the Radio Set Control C-451A/ARC-21 and turn the "CHANNEL" selector to this channel.
c. Watch the tuning operation of the power amplifier tuning coil and adjust the control R137 in small increments to provide the least mechanical oscillation for normal transmitter power output.

7-23. SETTING MODULATION LEVEL.

7-24. Use the following procedure to set the modulation level:

a. Connect Audio Oscillator TS-382/U across terminals 28 and 29 of the junction box. Adjust audio output signal to 6 volts. Terminal number 29 is the audio ground.
b. Couple Oscilloscope OS-8/U to the antenna through terminal D3 on terminal board E106 of the oscilloscope. Remove cover A106, after turning the oscilloscope off to give access to terminal E106.
c. Set "POWER" control on Radio Set Control C-451A/ARC-21 to "HI."
d. Press microphone button to hold equipment in transmitting condition.
e. Adjust scope to oscillator frequency (1000 cycles per second) to obtain pattern and adjust modulator gain control until 100 percent modulation is indicated on the scope.


TO POWER AMPL J401
P103
TO POWER AMPL J402
P104
1
7
3
2
R145
17.8K
3W
R148
28.7K
4W
R146
28.7K
4W
R147
14.7K
3W

NOTE 1:
ALL RESISTORS 1/2 WATT
UNLESS OTHERWISE SHOWN.

NOTE 2:
ALL CAPACITORS IN MF
UNLESS OTHERWISE SHOWN.

Amplifier, Audio Frequency AM-773A/ARC-21, Schematic Diagram

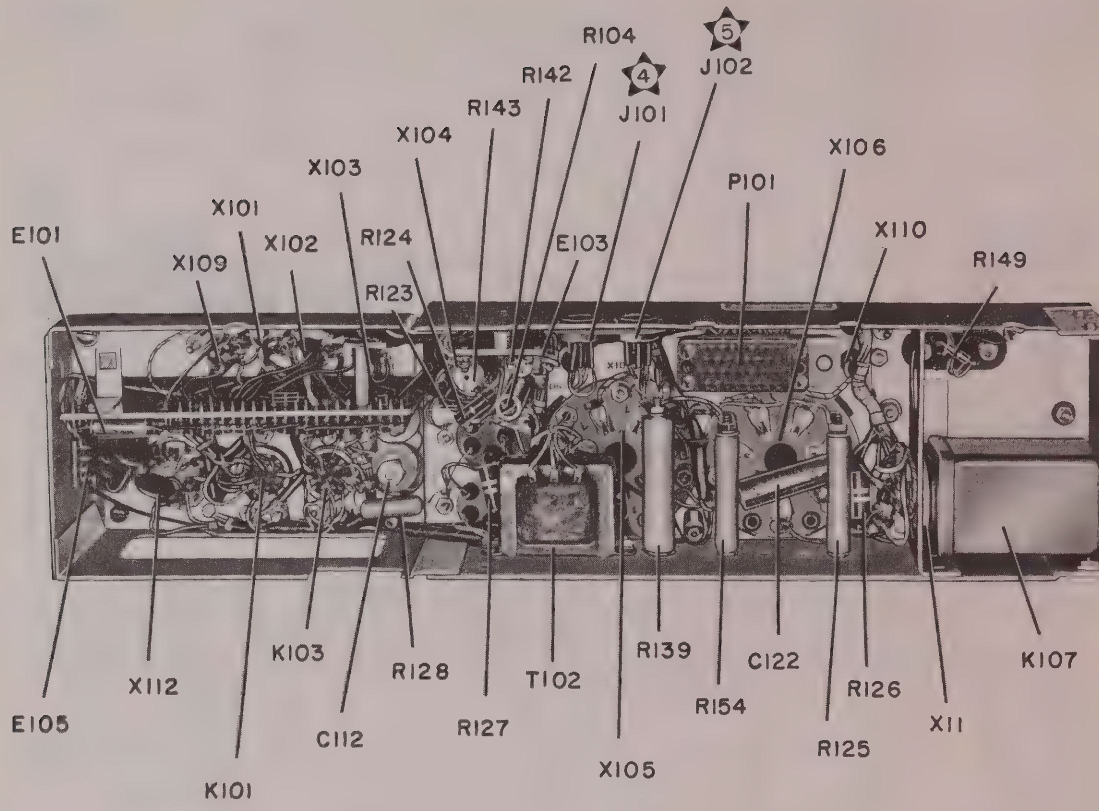


Figure 7-3. Amplifier, Audio Frequency AM-773A/ARC-21, Bottom

NOTE

If resistor R106 is set too high, the coil roller may be too far from resonance when servo tuning starts. This may so restrict the mechanical power of the system that the coil roller will either stop prior to the loading cycle or scan back to the home position and result in a failure to tune. After tuning cycle is functioning properly, check tuning in each of the four bands by loosely coupling a Frequency Meter FR-47/U to output of the transmitter and checking output against channel switch setting.

g. Set channel frequency for 23.9995 mc.

h. Press microphone button to initiate tuning cycle. If tuning does not proceed smoothly, reduce gain setting of resistor R137 slightly.

i. Set "POWER" control on Radio Set Control C-451A/ARC-21 to "LOW."

j. Repeat steps e and f, adjusting "LOW" scan control R105 in the same manner as R106.

7-21. ADJUSTMENT OF SERVO GAIN CONTROL R137.

7-22. Use the following procedure to set the servo gain control R137:

a. Set it to the three-quarter maximum clockwise position.

b. Set up a frequency of 20 megacycles in the Radio Set Control C-451A/ARC-21 and turn the "CHANNEL" selector to this channel.

c. Watch the tuning operation of the power amplifier tuning coil and adjust the control R137 in small increments to provide the least mechanical oscillation for normal transmitter power output.

7-23. SETTING MODULATION LEVEL.

7-24. Use the following procedure to set the modulation level:

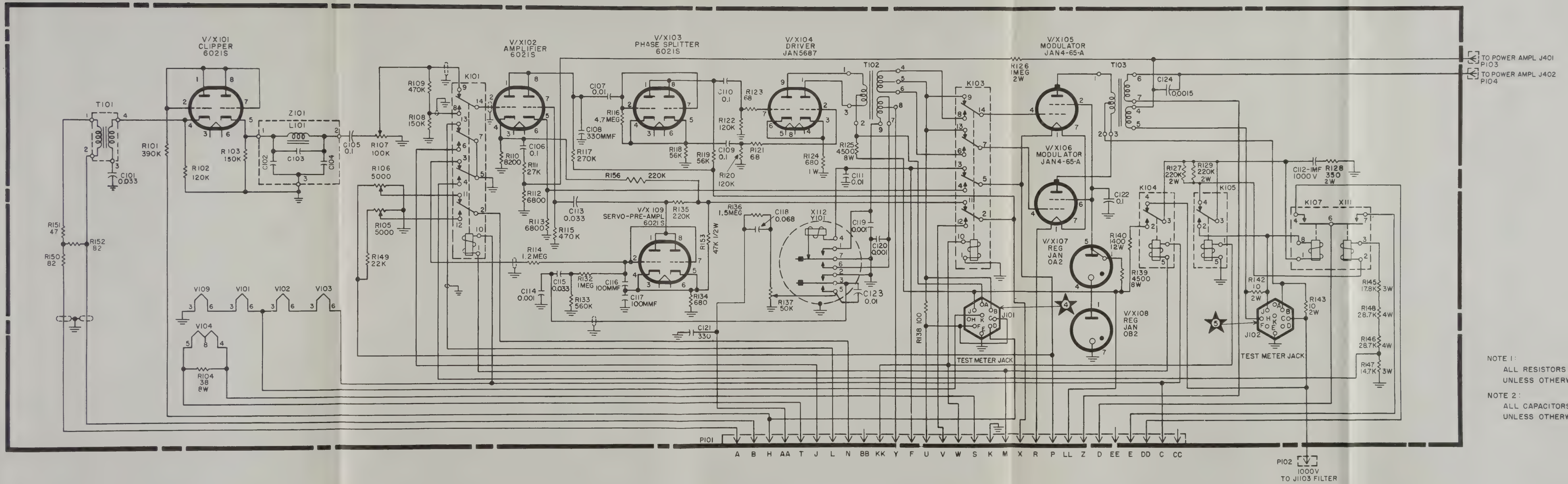
a. Connect Audio Oscillator TS-382/U across terminals 28 and 29 of the junction box. Adjust audio output signal to 6 volts. Terminal number 29 is the audio ground.

b. Couple Oscilloscope OS-8/U to the antenna through terminal D3 on terminal board E106 of the oscilloscope. Remove cover A106, after turning the oscilloscope off to give access to terminal E106.

c. Set "POWER" control on Radio Set Control C-451A/ARC-21 to "HI."

d. Press microphone button to hold equipment in transmitting condition.

e. Adjust scope to oscillator frequency (1000 cycles per second) to obtain pattern and adjust modulator gain control until 100 percent modulation is indicated on the scope.



V/X101
CLIPPER
6021S
T101
R101
390K
R102
120K
R103
150K
C101
0.033
Z101
L101
C102
C103
C104
C105
0.1
R107
100K
R109
470K
R108
150K
K101
R106
5000
R105
5000
R149
22K
V/X102
AMPLIFIER
6021S
R110
8200
C106
0.1
R111
27K
R112
6800
R113
6800
R115
470K
C107
0.01
C108
330MMF
R116
4.7MEG
R117
270K
V/X103
PHASE SPLITTER
6021S
R118
56K
R119
56K
C110
0.1
R123
68
R122
120K
C109
0.1
R121
68
R120
120K
R156
220K
C113
0.033
V/X 109
SERVO-PRE-AMPL
6021S
R135
220K
R153
47K 1/2W
R114
1.2MEG
C114
0.001
C115
0.033
R132
1MEG
R133
560K
C116
100MMF
C117
100MMF
R134
680
R136
1.5MEG
C118
0.068
X112
Y101
C119
0.001
C120
0.001
R137
50K
C123
0.01
C121
330
V/X104
DRIVER
JAN5687
T102
R124
680
1W
R125
4500
8W
C111
0.01
R126
1MEG
2W
K103
R138 100
J101
TEST METER JACK
V/X105
MODULATOR
JAN4-65-A
T103
C124
0.0015
V/X106
MODULATOR
JAN4-65-A
C122
0.1
V/X107
REG
JAN
0A2
R140
1400
12W
R139
4500
8W
V/X108
REG
JAN
0B2
R127
220K
2W
R129
220K
2W
K104
K105
C112-1MF
1000V
R128
350
2W
K107
X111
R142
10
2W
R143
10
2W
J102
TEST METER JACK
R145
17.8K 3W
R148
28.7K 4W
R146
28.7K 4W
R147
14.7K 3W
R151
47
R152
82
R150
82
V109
V101
V102
V103
V104
R104
38
8W
TO POWER AMPL J401
P103
TO POWER AMPL J402
P104
P101
A B H AA T J L N BB KK Y F U V W S K M X R P LL Z D EE E DD C CC
P102
1000V
TO J1103 FILTER

NOTE 1:
ALL RESISTORS 1/2 WATT
UNLESS OTHERWISE SHOWN.

NOTE 2:
ALL CAPACITORS IN MF
UNLESS OTHERWISE SHOWN.

Figure 7-4. Amplifier, Audio Frequency AM-773A/ARC-21, Schematic Diagram

WIRE TABLE

DESCRIPTION		
OLOR AND CONDUCTOR		
E WHT RED TR	AWG 24	600V
ORN		
YEL		
GRN		
BLU TR		
BLK/BRN TR		
BRN/RED		
BLK/GRN		
BLK/RED		
BRN/GRN		
BRN/BLU		
RED/BLK		
BRN TR		
RED/GRN		
RED/BLU		
BLK TR		
YEL/BLK		
YEL/RED		
YEL/GRN		
GRN/BLK		
GRN/BRN		
GRN/RED		
WHT BLU/BRN TR		
BLK		
BRN		
RED		
YEL		
ORN		
WHT	AWG 24	600V
E WHT BLK/GRN/TR	AWG20	600V
BRN/RED		
BRN/GRN		
BRN/BLU		
RED/BLK		
RED/GRN		
RED/BLU TR		
BLU TR	AWG20	600V
E WHT BRN TR	AWG18	600V
LE SHIELDED WHT BLK TR		
WHITE		
WHT-RED TR		
WHT-GRN TR		
LE SHIELDED WHT BRN TR		
E .0201 DIA TINNED COPPER		
EVING BLACK .022 I.D		
EVING BLACK .053 DIA		
EVING BLACK .095 DIA		
EVING YEL 3/32 DIA		
EVING BLACK .034 DIA		
EVING WHITE .450 I.D		
EVING BLACK .148 I.D		

SECTION VIII

MAINTENANCE INSTRUCTIONS FOR RELAY ASSEMBLY RE-134A/ARC-21

8-1. TROUBLE ANALYSIS.

8-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

8-3. This chassis includes the tubes and relays required for automatic tuning of the Amplifier-Oscillator AM-776A/ARC-21 chassis. These functions consist of speed reducing, reversing clutch operation, final tuning control. The circuits also include a four-step audio attenuator S201, side-tone audio oscillator V203 and "VOICE-CW" transfer relay K209.

8-4. After correcting any obvious defects, cable the chassis into the test setup, look for the symptoms indicated on table XXXV.

a. Set controls on radio set control for "CW" operation, "POWER" at "LOW" and "CONTROL" at "ON." Select channel in range of 2.5 to 3.5 megacycles.

b. Set the audio attenuator switch S201 to the prescribed position for the particular type aircraft installation when known. Note the marking "LO" indicates the minimum output. The usual setting, unless otherwise prescribed, is number 3. This is one step down from maximum output.

c. Allow equipment to warm up and tune. Observe the tuning dials on the end of the Amplifier-Oscillator AM-776A/ARC-21 chassis.

d. Probable causes of abnormal or incorrect operation are listed in table XXXVI.

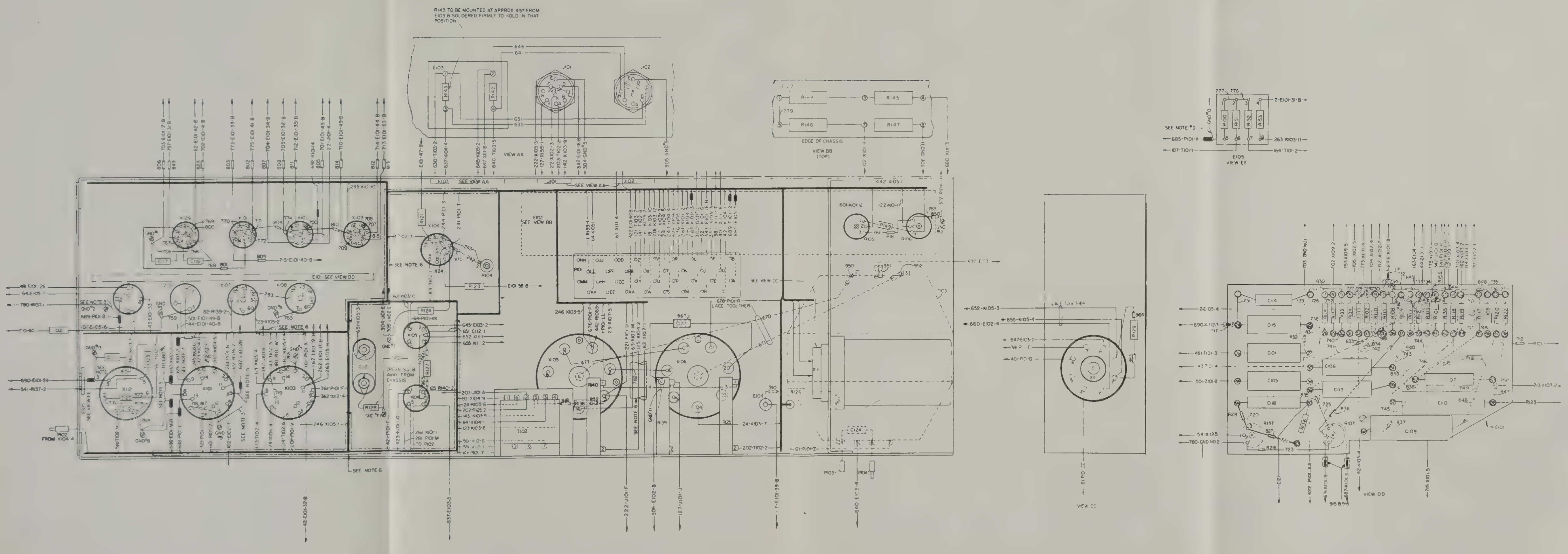
TABLE XXXV. PRELIMINARY OPERATIONAL CHECK, RELAY ASSEMBLY RE-134A/ARC-21

Symptom	Defective Component
Tuning cycle fails to start	K203 or K204
Homes, does not scan	K205, K202
Scans, does not operate	K206, K201, V201 or tuner
Scans, clutch O501 operates, but does not tune	Incorrect setting of R206, K204 or K206

TABLE XXXVI. TROUBLE ANALYSIS, RELAY ASSEMBLY RE-134A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 8-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	8 (J201)	Test Meter plugged in. Selector switch at position 4	Radio Set Control C-451/ARC-21 set for "VOICE" operation, "POWER" at "LOW," "CONTROL" at "ON"	+140 volts (Plate supply)	Plug or chassis wiring Defective V206
2	8 (J201)	Selector switch at position 5	Same as step 1	+75 volts (Regulated)	Adjust R218 Defective V205 or V206
3	8 (J201)	Selector switch at position 6	Same as step 1	27 volts (Relay supply)	Plug or chassis wiring
4	8 (J201)	Selector switch at position 7	Same as step 1	-20 volts (Bias supply)	Plug or chassis wiring Defective V209
5	8 (J201)	Selector switch at position 8	Same as step 1	7.5 volts	Adjust R206* Plug, chassis wiring or V202 defective


R143 TO BE MOUNTED AT APPROX 45° FROM E103-8 SOLDERED FIRMLY TO HOLD IN THAT POSITION
VIEW AA
EDGE OF CHASSIS
VIEW BB (TOP)
SEE VIEW AA
SEE VIEW BB
SEE VIEW CC
SEE VIEW DD
SEE NOTE 6
VIEW EE
VIEW CC
VIEW DD
LACE TOGETHER

WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1-4	WIRE WHT RED TR AWG 24 600V
22-24	ORN
42-44	YEL
[illegible]-64	GRN
82-84	BLU TR
102-107	BLK/BRN TR
[illegible]-127	BRN/RED
[illegible]-143	BLK/GRN
[illegible]-164	BLK/RED
[illegible]-182	BRN/GRN
20[illegible]-203	BRN/BLK
22[illegible]-223	RED/BLK
24[illegible]-246	BRN TR
26[illegible]-263	RED/GRN
28[illegible]-282	RED/BLU
302-306	BLK TR
32	YEL/BLK
341-342	[illegible]
36[illegible]-362	RED/GRN
38	GRN/BLK
40	GRN/BRN
421-423	GRN/RED
442	WHT BLK/BRN TR
48	[illegible]
50	[illegible]
54	[illegible]
56	[illegible]
58	[illegible]
[illegible]	WIRE WHT AWG 24 600V
630-631	WIRE WHT BLK/GRN TR AWG 20 600V
635-637	BRN/RED
640-64[illegible]	BRN/GRN
645-647	BRN/BLU
650-652	RED/BLK
65[illegible]	RED/GRN
66[illegible]	RED/BLU
670-67[illegible]	BLU TR AWG 20 600V
676-678	WIRE WHT BRN TR AWG 8 600V
685-686	CABLE SHIELDED WHT BLK TR
687	WHITE
688-689	WHT RED TR
690-691	WHT GRN TR
692	CABLE SHIELDED WHT BRN TR
700-783	WIRE .020 DIA TINNED COPPER
800-852	SLEEVING BLACK [illegible]
[illegible]-92[illegible]	SLEEVING BLACK .125 DIA
[illegible]-918	SLEEVING BLACK .095 DIA
950-962	SLEEVING WHITE 3/32 DIA
[illegible]-966	SLEEVING BLACK [illegible] DIA
[illegible]	SLEEVING WHITE .450 [illegible]
970	SLEEVING BLACK .48 [illegible]

Figure 7-5. Amplifier, Audio Frequency AM-773A/ARC-21, Connection Diagram

SECTION VIII

MAINTENANCE INSTRUCTIONS FOR RELAY ASSEMBLY RE-134A/ARC-21

8-1. TROUBLE ANALYSIS.

8-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

8-3. This chassis includes the tubes and relays required for automatic tuning of the Amplifier-Oscillator AM-776A/ARC-21 chassis. These functions consist of speed reducing, reversing clutch operation, final tuning control. The circuits also include a four-step audio attenuator S201, side-tone audio oscillator V203 and "VOICE-CW" transfer relay K209.

8-4. After correcting any obvious defects, cable the chassis into the test setup, look for the symptoms indicated on table XXXV.

a. Set controls on radio set control for "CW" operation, "POWER" at "LOW" and "CONTROL" at "ON." Select channel in range of 2.5 to 3.5 megacycles.

b. Set the audio attenuator switch S201 to the prescribed position for the particular type aircraft installation when known. Note the marking "LO" indicates the minimum output. The usual setting, unless otherwise prescribed, is number 3. This is one step down from maximum output.

c. Allow equipment to warm up and tune. Observe the tuning dials on the end of the Amplifier-Oscillator AM-776A/ARC-21 chassis.

d. Probable causes of abnormal or incorrect operation are listed in table XXXVI.

TABLE XXXV. PRELIMINARY OPERATIONAL CHECK, RELAY ASSEMBLY RE-134A/ARC-21

Symptom	Defective Component
Tuning cycle fails to start	K203 or K204
Homes, does not scan	K205, K202
Scans, does not operate	K206, K201, V201 or tuner
Scans, clutch O501 operates, but does not tune	Incorrect setting of R206, K204 or K206

TABLE XXXVI. TROUBLE ANALYSIS, RELAY ASSEMBLY RE-134A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 8-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	8 (J201)	Test Meter plugged in. Selector switch at position 4	Radio Set Control C-451/ARC-21 set for "VOICE" operation, "POWER" at "LOW," "CONTROL" at "ON"	+140 volts (Plate supply)	Plug or chassis wiring Defective V206
2	8 (J201)	Selector switch at position 5	Same as step 1	+75 volts (Regulated)	Adjust R218 Defective V205 or V206
3	8 (J201)	Selector switch at position 6	Same as step 1	27 volts (Relay supply)	Plug or chassis wiring
4	8 (J201)	Selector switch at position 7	Same as step 1	-20 volts (Bias supply)	Plug or chassis wiring Defective V209
5	8 (J201)	Selector switch at position 8	Same as step 1	7.5 volts	Adjust R206* Plug, chassis wiring or V202 defective

TABLE XXXVI. TROUBLE ANALYSIS, RELAY ASSEMBLY RE-134A/ARC-21 (continued)

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
6	8 (J201)	Same as step 5	Same as step 1 Move "CHANNEL" switch to next channel	4 to 12 volts while tuning**	Defective V201 or V202 K201 to K205 inclusive
7	8 (J201) pin C to ground	Same as step 6	Same as step 1	6.5 volts approx. only during tuning cycle	Varies with R206 (see step 5). Defective K202, K203 or V202
8	8 (J201) pin B to ground	Voltmeter TS-375/U. D-c probe 12-volt scale	Same as step 1	3 to 5 volts†	Chassis or wiring

*See paragraph 8-4 for details.

**See paragraph 8-11 for details.

†When Amplifier-Oscillator AM-776A/ARC-21 is in "Manual" and tuned for maximum.

TABLE XXXVII. RESISTANCE VALUES IN OHMS, FROM PLUG P201 TO GROUND

Pin	A	B	C	D	E	F	H	J	K	L
Reading	*	*	*	0	*	*	112k	6500	10, 800	*
Pin	M	N	P	R	S	T	U	V	W	X
Reading	54k	25	*	*	13.5	-	*	*	*	*
Pin	Y	Z	AA	BB	CC	DD	EE	FF	HH	JJ
Reading	*	6.8	*	*	86k	*	*	*	*	*
Pin	KK	LL	MM	NN						
Reading	*	*	*	*						

*Infinite resistance value.

TABLE XXXVIII. RESISTANCE CHART, RELAY ASSEMBLY RE-134A/ARC-21

Resistance in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Test Conditions: Removed from system, no cables attached.

Tube		Pin Number								
Symbol	Type	1	2	3	4	5	6	7	8	9
V201	-5643	*	500	0	500	500	2.2	*	*	-
V202	-5840	*	1750	0	1750	0	2.2	0	1750	-
V203	-5898	1 meg	*	0	*	*	2.2	*	*	-
V204	-991	0	200k	-	-	-	-	-	-	-
V205	-5840	300k	200k	13.5	200k	*	6.8	235k	200k	-
V206	-5687	*	*	190k	6.9	2.5	190k	*	4.7	*

*Infinite resistance value.

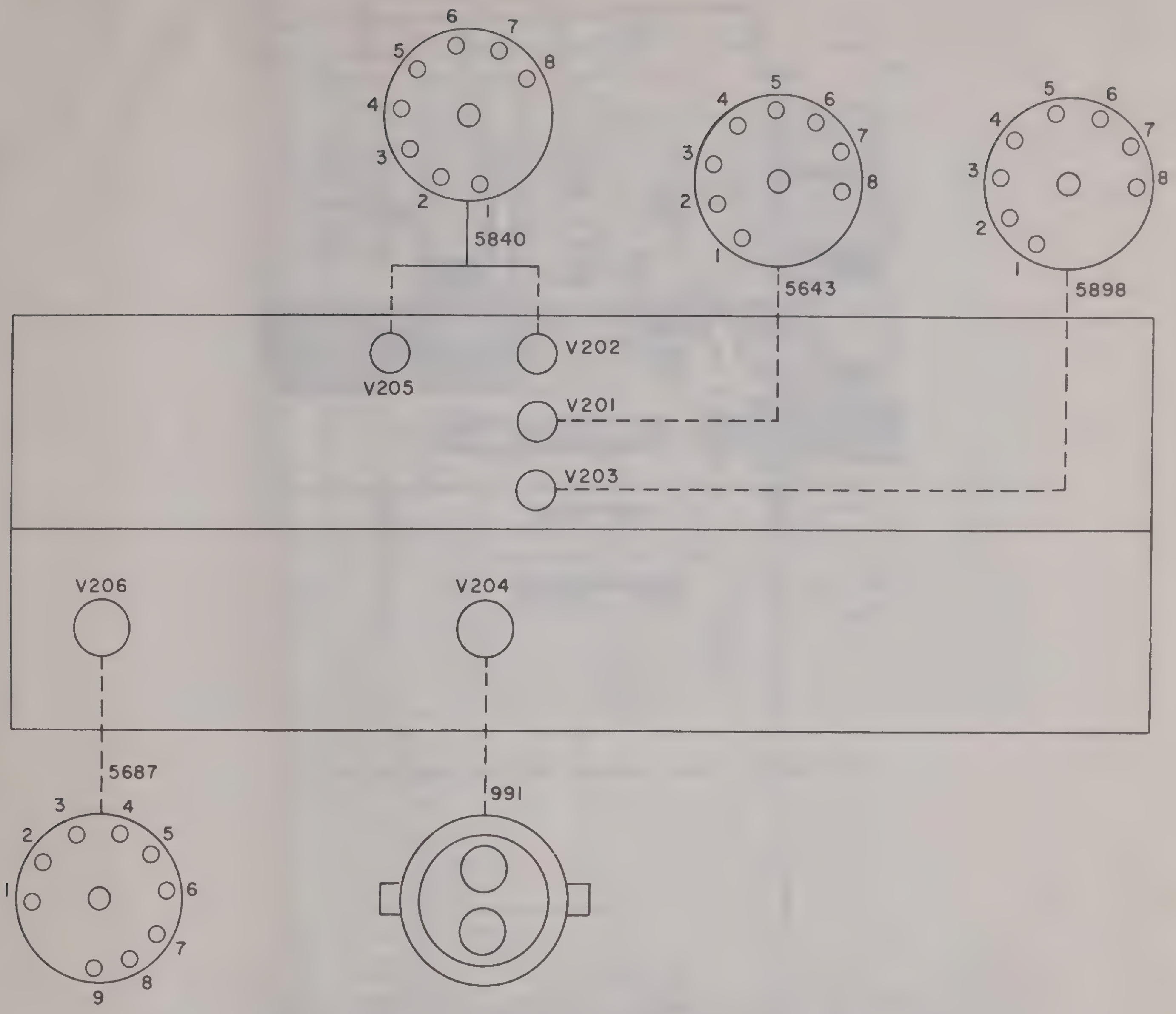

6
7
5
8
4
3
2
1
5840
5
4
6
3
7
8
2
1
5643
5
6
4
7
3
8
2
1
5898
V205
V202
V201
V203
V206
V204
5687
3
4
2
5
1
6
7
9
8
991

Figure 8-1. Relay Assembly RE-134A/ARC-21, Tube Location

TABLE XXXIX. VOLTAGE CHART, RELAY ASSEMBLY RE-134A/ARC-21

All voltages dc to ground unless otherwise noted.
Measurements made with Multimeter TS-352/U.
*Readings taken with Voltmeter TS-375/U.
Test Condition: Chassis connected to Chassis, Receiver-Transmitter MX-1424A/ARC-21 by test cables.

Tube		Pin Number								
Symbol	Type	1	2	3	4	5	6	7	8	9
V201	-5643	73	-	0	0.16	0.16	6.6	*1.78	-	-
V202	-5840	*7.2	-	0	-	0	6.6	0	0.25	-
V203	-5898	0	-	0	-	0.03	6.6	-	0	-
V204	-991	0	60	-	-	-	-	-	-	-
V205	-5840	58	-	25.6	-	74	19.5	71	60	-
V206	-5687	140	75	75	19.4	6.6	75	75	-	140

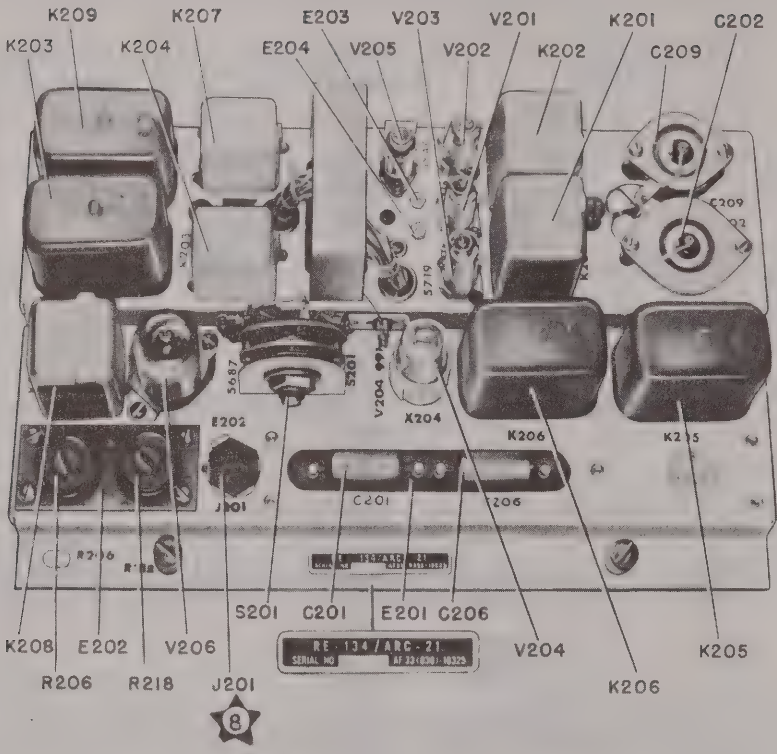

K209
K207
E203
V203
V201
K201
C202
K203
K204
E204
V205
V202
K202
C209
S201
C201
E201
C206
K208
E202
V206
V204
K205
R206
R218
J201
K206
RE-134/ARC-21
SERIAL NO
AF 33(038)-10325
8

Figure 8-2. Relay Assembly RE-134A/ARC-21, Top

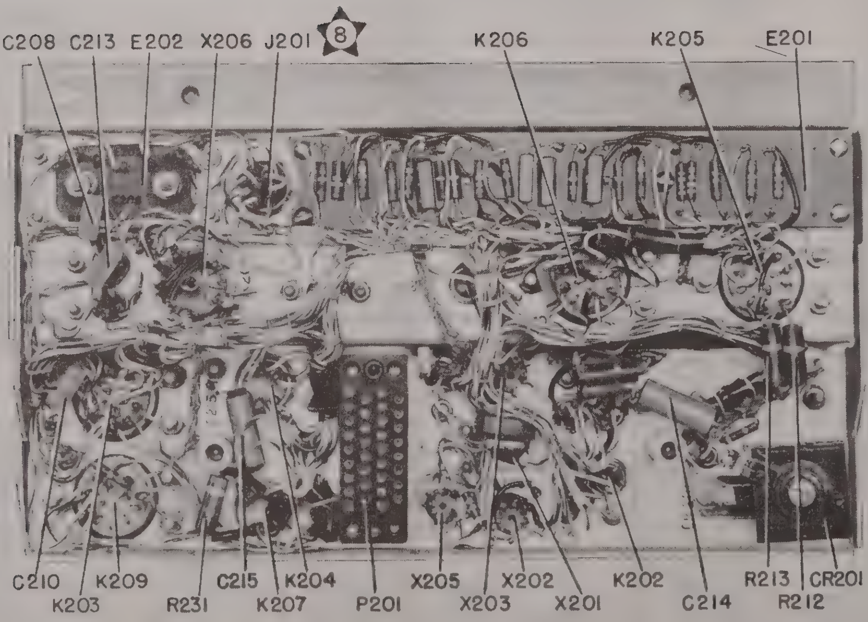
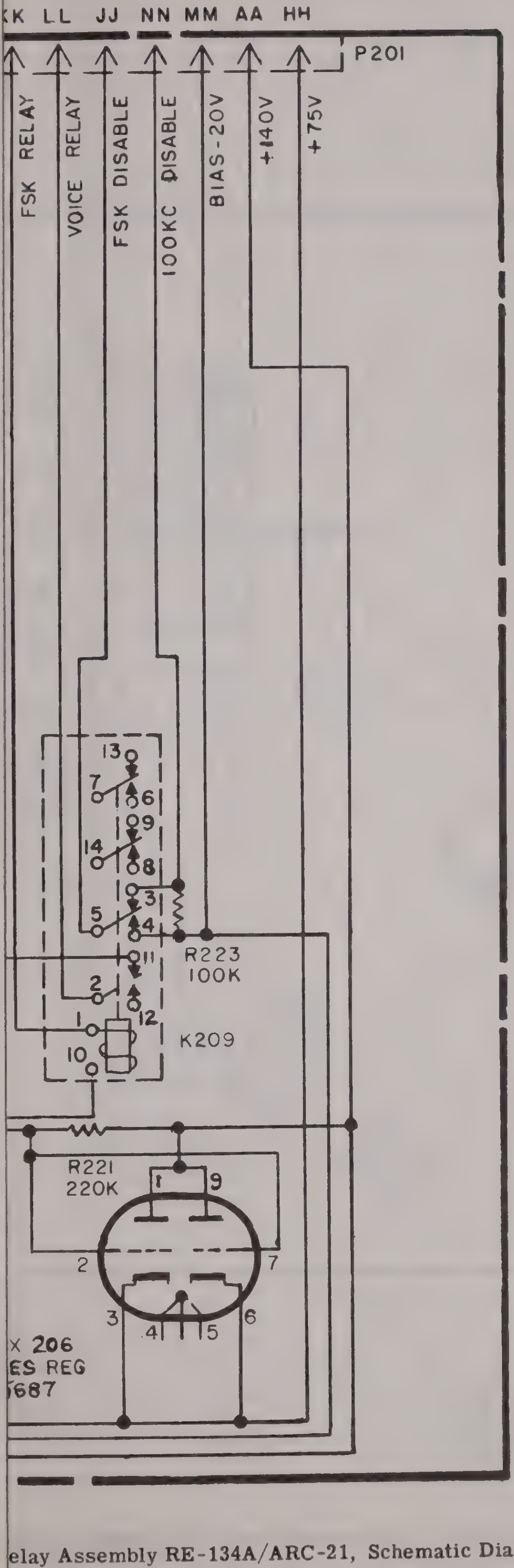

C208
C213
E202
X206
J201
8
K206
K205
E201
C210
K209
K203
R231
C215
K204
K207
P201
X205
X203
X202
X201
K202
C214
R213
CR201
R212

Figure 8-3. Relay Assembly RE-134A/ARC-21, Bottom


KK
LL
JJ
NN
MM
AA
HH
P201
FSK RELAY
VOICE RELAY
FSK DISABLE
100KC DISABLE
BIAS-20V
+140V
+75V
13
7
6
9
14
8
3
5
4
11
2
12
1
10
R223
100K
K209
R221
220K
1
9
2
7
3
4
5
6
x 206
ES REG
5687

NOTE I:
ALL RESISTORS 1/3
WATT UNLESS
OTHERWISE SHOWN

elay Assembly RE-134A/ARC-21, Schematic Diagram

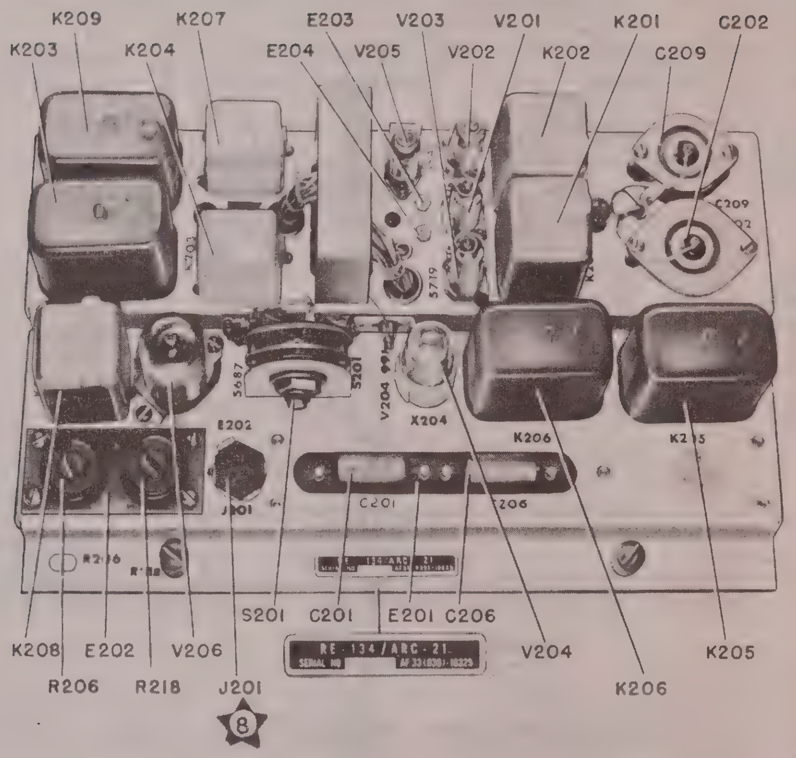

K209
K207
E203
V203
V201
K201
C202
K203
K204
E204
V205
V202
K202
C209
S201
C201
E201
C206
K208
E202
V206
V204
K205
R206
R218
J201
K206
8

Figure 8-2. Relay Assembly RE-134A/ARC-21, Top

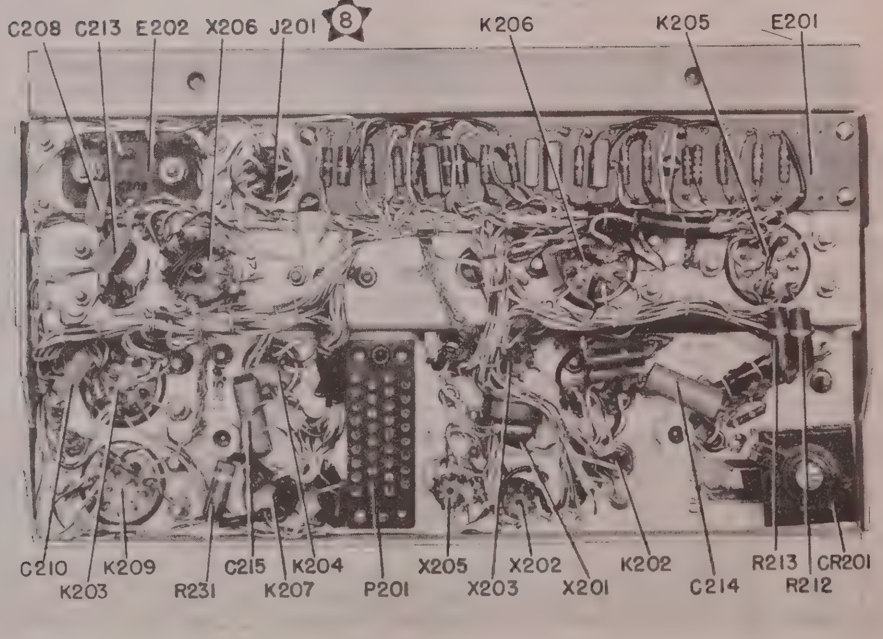
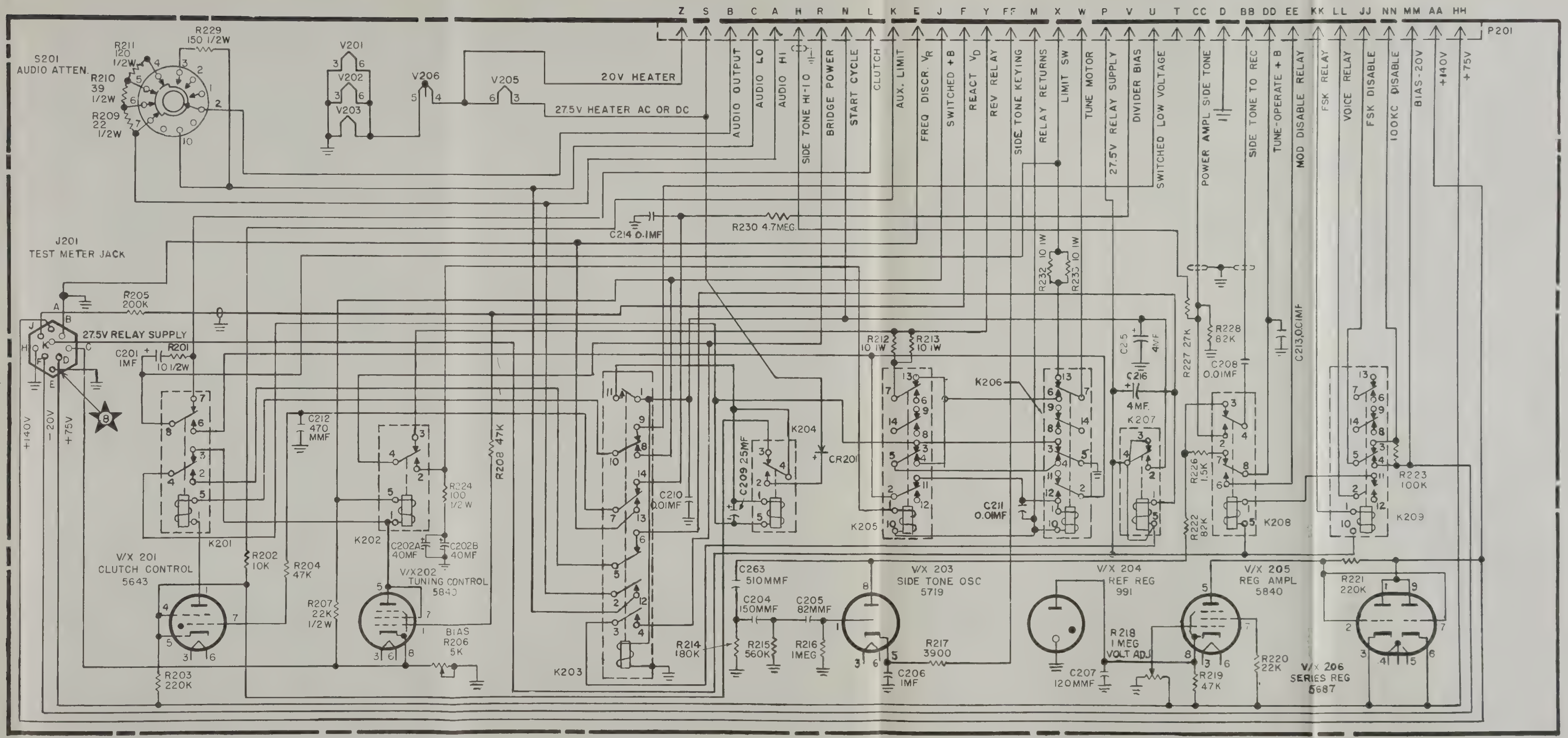
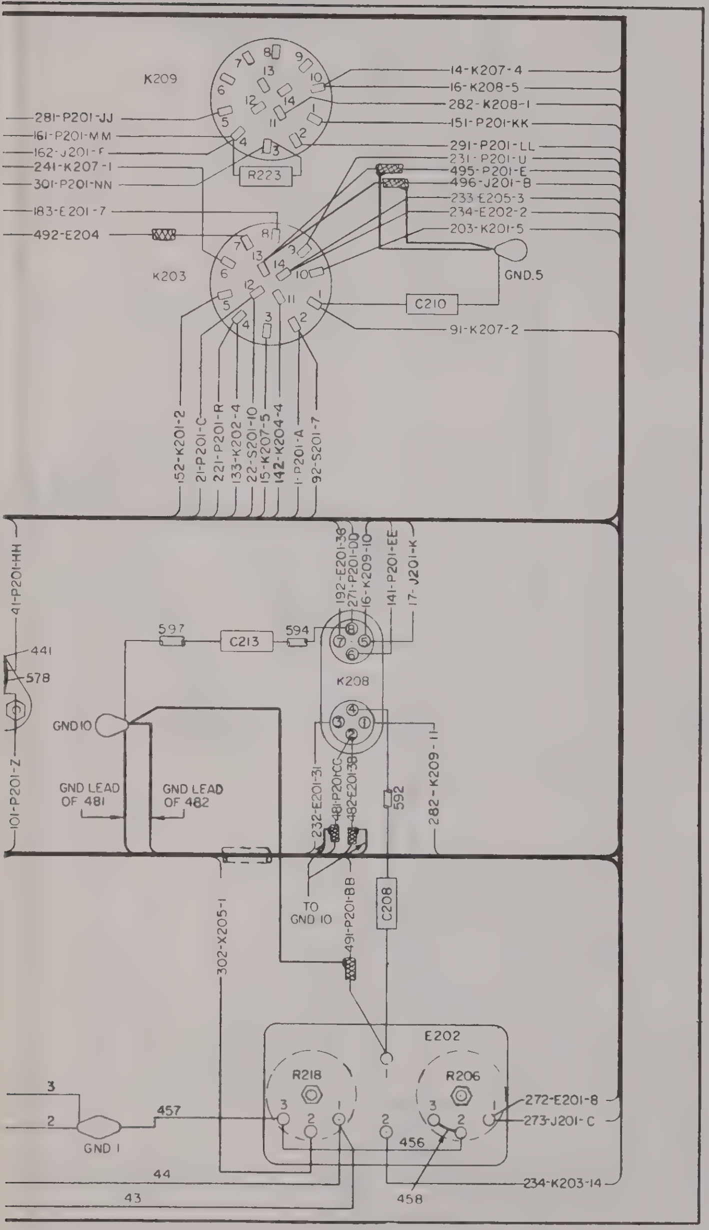

C208
C213
E202
X206
J201
8
K206
K205
E201
C210
K209
C215
K204
X205
X202
K202
R213
CR201
K203
R231
K207
P201
X203
X201
C214
R212

Figure 8-3. Relay Assembly RE-134A/ARC-21, Bottom


Z S B C A H R N L K E J F Y FF M X W P V U T CC D BB DD EE KK LL JJ NN MM AA HH
P201
AUDIO OUTPUT
AUDIO LO
AUDIO HI
SIDE TONE HI-LO
BRIDGE POWER
START CYCLE
CLUTCH
AUX. LIMIT
FREQ DISCR. V_R
SWITCHED +B
REACT V_D
REV RELAY
SIDE TONE KEYING
RELAY RETURNS
LIMIT SW
TUNE MOTOR
27.5V RELAY SUPPLY
DIVIDER BIAS
SWITCHED LOW VOLTAGE
POWER AMPL SIDE TONE
SIDE TONE TO REC
TUNE-OPERATE + B
MOD DISABLE RELAY
FSK RELAY
VOICE RELAY
FSK DISABLE
100KC DISABLE
BIAS-20V
+140V
+75V
S201 AUDIO ATTEN.
R211 120 1/2W
R210 39 1/2W
R209 22 1/2W
R229 150 1/2W
V201
V202
V203
V206
V205
20V HEATER
27.5V HEATER AC OR DC
C214 0.1MF
R230 4.7MEG
J201 TEST METER JACK
R205 200K
27.5V RELAY SUPPLY
C201 1MF
R201 10 1/2W
+140V
-20V
+75V
8
C212 470 MMF
R208 47K
R224 100 1/2W
C202A 40MF
C202B 40MF
K201
K202
K203
K204
C209 25MF
CR201
C210 0.01MF
K205
R212 10 1W
R213 10 1W
K206
R232 10 1W
R233 10 1W
C211 0.01MF
C215 4MF
C216 4MF
K207
R227 27K
R228 82K
C208 0.01MF
C213 0.01MF
R226 1.5K
R222 82K
K208
K209
R223 100K
V/X 201 CLUTCH CONTROL 5643
R202 10K
R204 47K
R203 220K
V/X202 TUNING CONTROL 5843
R207 22K 1/2W
BIAS R206 5K
C263 510MMF
C204 150MMF
C205 82MMF
R214 180K
R215 560K
R216 1MEG
V/X 203 SIDE TONE OSC 5719
R217 3900
C206 1MF
V/X 204 REF REG 991
R218 1MEG VOLT ADJ.
C207 120MMF
V/X 205 REG AMPL 5840
R219 47K
R220 22K
V/X 206 SERIES REG 5687
R221 220K

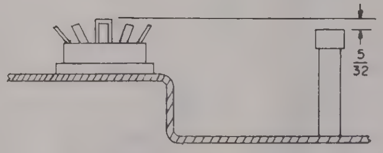
NOTE 1:
ALL RESISTORS 1/3 WATT UNLESS OTHERWISE SHOWN

Figure 8-4. Relay Assembly RE-134A/ARC-21, Schematic Diagram

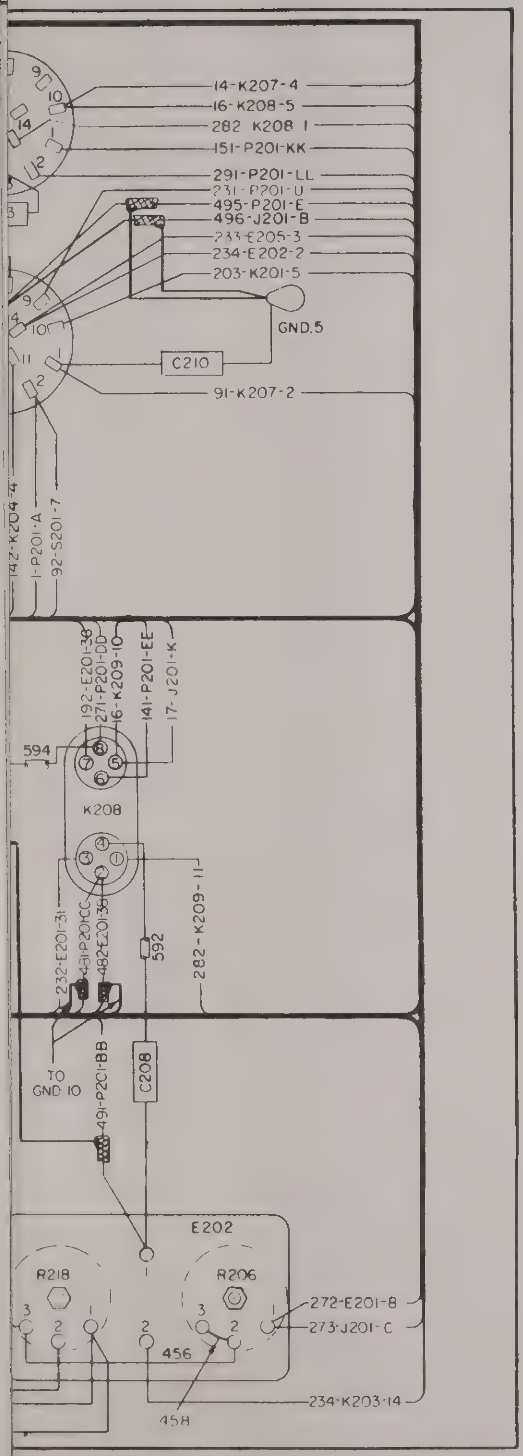

K209
14-K207-4
16-K208-5
282-K208-1
151-P201-KK
291-P201-LL
231-P201-U
495-P201-E
496-J201-B
233-E205-3
234-E202-2
203-K201-5
281-P201-JJ
161-P201-MM
162-J201-F
241-K207-1
301-P201-NN
R223
183-E201-7
492-E204
K203
GND.5
C210
91-K207-2
152-K201-2
21-P201-C
221-P201-R
133-K202-4
22-S201-10
15-K207-5
142-K204-4
1-P201-A
92-S201-7
41-P201-HH
441
578
597
C213
594
192-E201-38
271-P201-DD
16-K209-10
141-P201-EE
17-J201-K
K208
GND10
101-P201-Z
GND LEAD OF 481
GND LEAD OF 482
232-E201-31
481-P201-CC
482-E201-38
592
282-K209-11
302-X205-1
TO GND 10
491-P201-BB
C208
E202
R218
R206
3
2
457
GND 1
456
272-E201-8
273-J201-C
44
43
234-K203-14
458

WIRE TABLE

WIRE NO (INCLUSIVE)	DESCRIPTION
	COLOR AND CONDUCTOR
1 - 4	WHT. BLK TR AWG 24 600
11 - 18	BRN
21 - 23	RED
32-34	ORN
41-44	YEL
51-52	GRN
61-64	BLU TR
71-72	BLK BRNTR
81-82	BLK RED
91 - 94	BLK GRN
101-105	BRN RED
111 - 113	BRN GRN
121-122	BRN BLU
132-133	RED BLK
141-142	RED GRN
151-152	RED BLU
161-163	YEL BLK
171-172	YEL RED
181-183	YEL GRN
191 192	GRN BLK
201-203	GRN BRN
211-212	GRN RED
221-223	BLU BRN
231 234	WHT BLU RED TR
241-243	BRN
251-252	GRN
262	RED
271-274	YEL
281-282	ORN
291-292	BLU
301-302	WHT AWG 24 600V
311-312	WHT BRN TR AWG 18 600V
433-473	WIRE TINNED COPPER 020 DIA
480 482	CABLE, SHIELDED WHT-RED
491 -493	CABLE, SHIELDED WHT-GRN
495 497	CABLE, SHIELDED WHT
551-578	SLVG. FIBERGLAS BLK .022 ID
591-597	SLVG. FIBERGLAS BLK .034 ID
599	SLVG. VINYL TRANSP. 5/16 ID

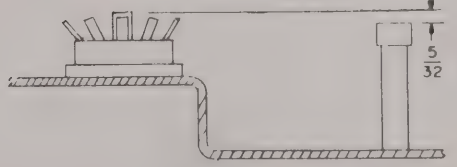


DETAIL (1)


14-K207-4
16-K208-5
282 K208 1
151-P201-KK
291-P201-LL
231-P201-U
495-P201-E
496-J201-B
233-E205-3
234-E202-2
203-K201-5
GND.5
C210
91-K207-2
142-K204-4
1-P201-A
92-S201-7
192-E201-38
271-P201-DD
16-K209-10
141-P201-EE
17-J201-K
594
K208
232-E201-31
481-P201-CC
482-E201-39
592
282-K209-11
TO GND 10
491-P201-BB
C208
E202
R218
R206
272-E201-8
273-J201-C
456
458
234-K203-14

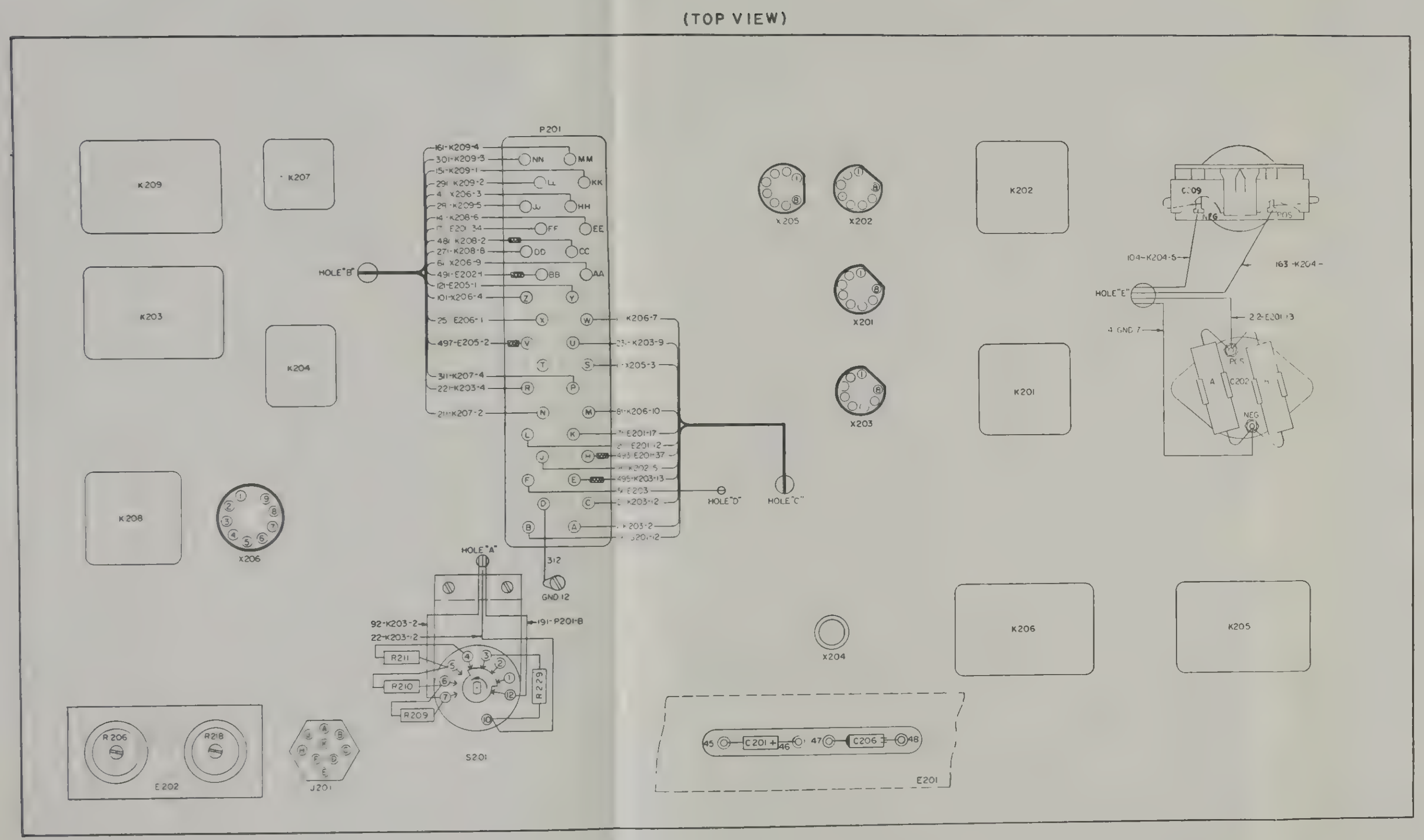
WIRE TABLE	
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1 5	WHT. BLK TR AWG 24 600V
11 18	BRN
21 23	RED
32 34	ORN
41 44	YEL
51 52	GRN
61-64	BLU TR
71 72	BLK BRN TR
81-82	BLK RED
91 94	BLK GRN
101-105	BRN RED
111 113	BRN GRN
121-122	BRN BLU
132-133	RED BLK
141-142	RED GRN
151-152	RED BLU
161-163	YEL BLK
171-172	YEL RED
181-183	YEL GRN
191 192	GRN BLK
201-203	GRN BRN
211 212	GRN RED
221 223	BLU BRN
231 234	WHT BLU RED TR
241 243	BRN
251-252	GRN
262	RED
271-274	YEL
281-282	ORN
291-292	BLU
301-302	WHT AWG 24 600V
311-312	WHT BRN TR AWG 18 600V
433-473	WIRE TINNED COPPER .020 DIA
480-482	CABLE, SHIELDED WHT-RED
491-493	CABLE, SHIELDED WHT-GRN
495 497	CABLE, SHIELDED WHT
551-578	SLVG. FIBERGLAS BLK .022 I.D.
591-597	SLVG FIBERGLAS BLK .034 ID.
599	SLVG. VINYL TRANSP. 5/16 ID.

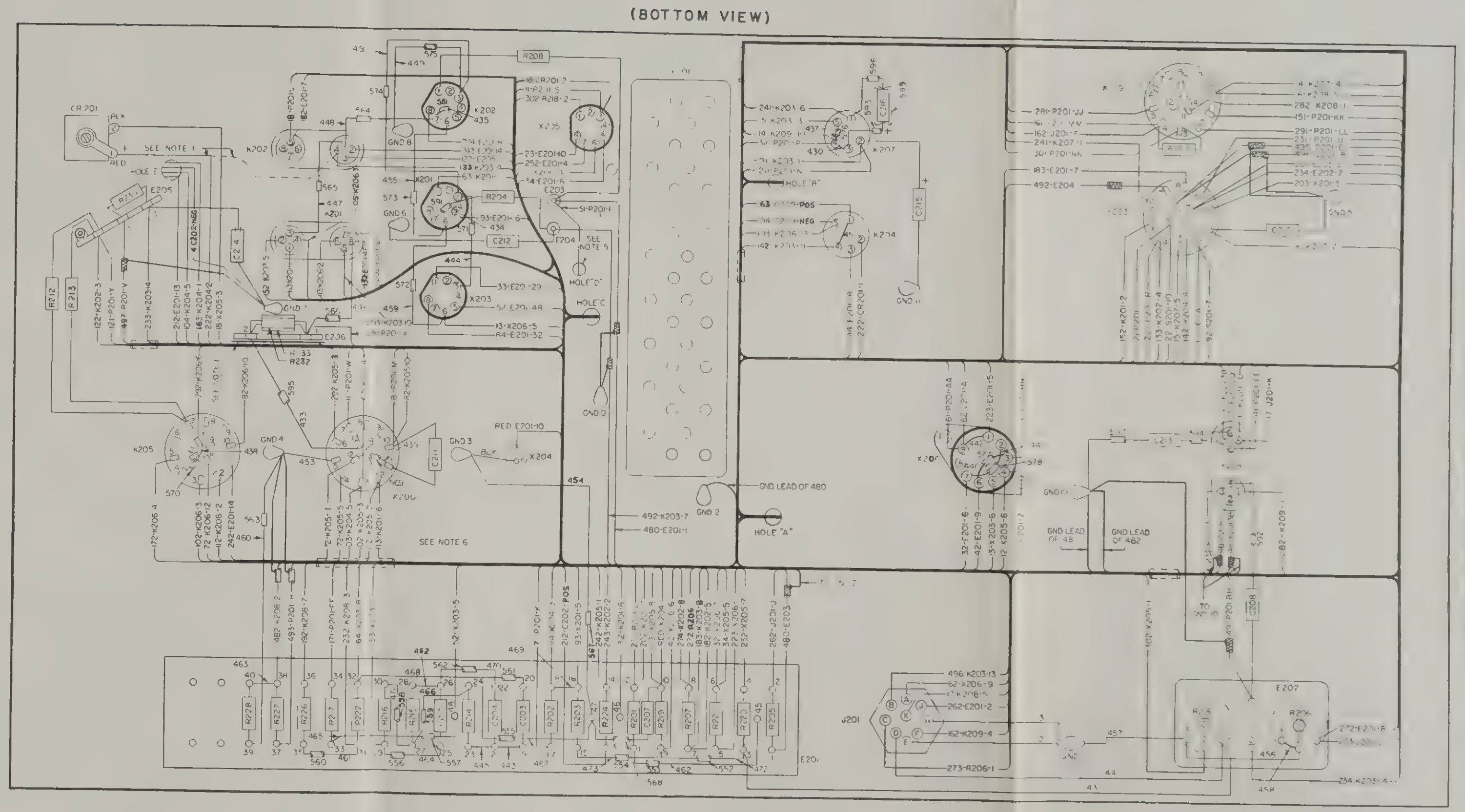
NOTE:
FOR USE WITH 60∿ POWER SUPPLY LEAD 222 MUST BE REMOVED FROM CR 201-1 & CONNECTED TO K 202-4.



DETAIL "Y"

Figure 8-5A. Relay Assembly RE-134A/ARC-21, Connection Diagram

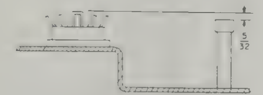

(TOP VIEW)
K209
K207
K203
K204
K208
K206
P201
HOLE "B"
HOLE "D"
HOLE "C"
HOLE "A"
GND 12
K205
K202
K201
K203
K204
K206
K205
R211
R210
R209
R279
S201
R206
R28
E202
J201
C201
C206
E201
HOLE "E"
C105


(BOTTOM VIEW)
CR201
SEE NOTE 1
HOLE "C"
K202
K201
K203
K205
K206
K204
K207
K208
K209
R232
GND 4
GND 3
GND 2
GND 1
HOLE "A"
HOLE "B"
SEE NOTE 6
GND LEAD OF 480
J201
E207
E201

NOTE

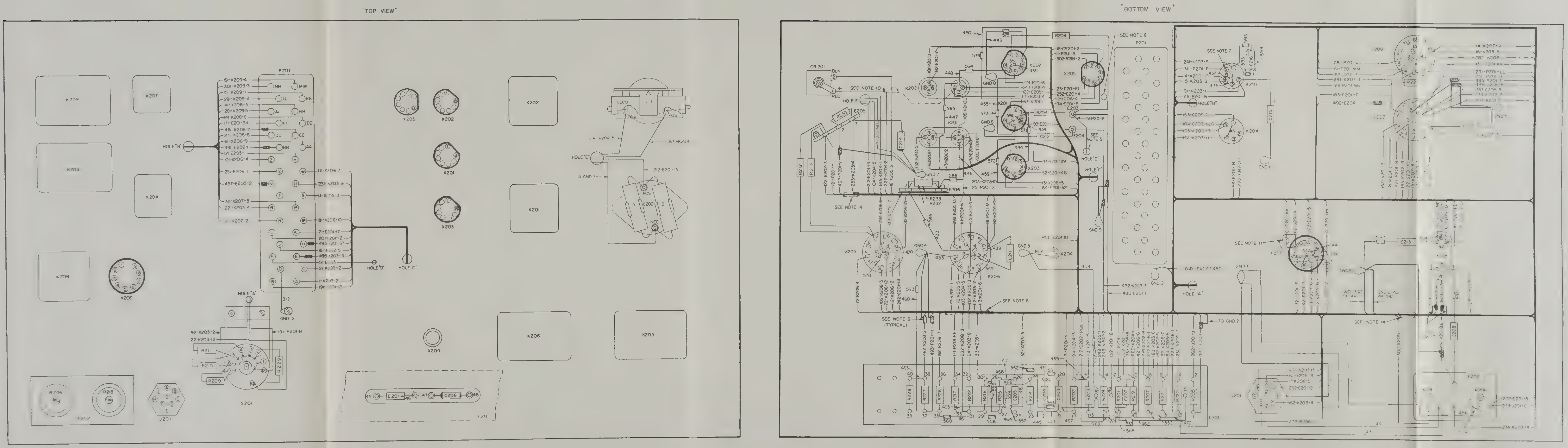
1 FOR USE WITH 60∿ POWER SUPPLY LEAD 222 MUST BE REMOVED FROM CR201-1 & CONNECTED TO K202-4

WIRE TABLE		
WIRE NO (INCLUSIVE)	DESCRIPTION	
	COLOR AND CONDUCTOR	
[illegible] 4	WHT BLK TR	AWG 24 600
[illegible]	BRN	
[illegible]	RED	
32 34	ORN	
41-44	YEL	
[illegible]	GRN	
[illegible]	BLU TR	
[illegible]	BLK BRN TR	
8 8	BLK RED	
[illegible] 94	BLK GRN	
[illegible]	BRN RED	
[illegible]	BRN GRN	
[illegible]	BRN BLU	
132-133	RED BLK	
[illegible]	RED GRN	
[illegible]	RED BLU	
161 163	YEL BLK	
171-172	YEL RED	
181-183	YEL GRN	
191-192	GRN BLK	
201 203	GRN BRN	
[illegible]	GRN RED	
[illegible]	BLU BRN	
[illegible]	WHT BLU RED TR	
[illegible]	BRN	
[illegible]	GRN	
[illegible]	RED	
[illegible]	YEL	
[illegible]	ORN	
[illegible]	BLU	
[illegible]	WHT	AWG 24 600V
[illegible]	WHT BRN TR	AWG 18 600V
433-473	WIRE TINNED COPPER	.020 DIA
[illegible]	CABLE, SHIELDED WHT-RED	
491-493	CABLE, SHIELDED WHT-GRN	
495-497	CABLE, SHIELDED WHT	
[illegible]	SLVG. FIBERGLAS BLK .022 ID	
591 597	SLVG FIBERGLAS BLK .034 ID	
599	SLVG VINYL TRANSP 5/16 ID	



DETAIL (I)

Figure 8-5. Relay Assembly RE-134A/ARC21, Connection Diagram


"TOP VIEW"
"BOTTOM VIEW"
K209
K207
K203
K204
K206
P201
HOLE "B"
HOLE "A"
HOLE "C"
HOLE "D"
HOLE "E"
K205
K202
K201
K203
X205
X202
X201
X203
X204
S201
E202
J201
R211
R210
R209
R229
GND 12
E201
E206
C209
POS
NEG
R206
R218
CR 201
BLK
RED
SEE NOTE 10
SEE NOTE 14
SEE NOTE 9 (TYPICAL)
SEE NOTE 6
SEE NOTE 8
SEE NOTE 7
SEE NOTE 5
SEE NOTE 11
R212
R230
E205
R208
R204
C212
E204
R233
R232
GND 7
GND 8
GND 6
GND 3
GND 4
GND 9
C211
C213
C215
TO GND 2
DETAIL "Y"

WIRE TABLE	
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
11 18	BRN
21 23	[illegible]
[illegible]	[illegible]
41 44	[illegible]
[illegible]	[illegible]
61 64	[illegible]
71 72	[illegible] BRN TR
81 82	BLK RED
[illegible]	[illegible]
[illegible]	BRN RED
111 113	BRN GRN
[illegible]-122	BRN BLU
132 133	RED BLK
141 14[illegible]	RED GRN
151-152	RED BLU
[illegible]	YEL BLK
171 172	YEL RED
181 183	YEL GRN
191 192	GRN BLK
201 203	GRN BRN
[illegible]	GRN RED
221 223	BLU BRN
[illegible]	WHT BLU RED TR
24[illegible] 243	BRN
[illegible] 252	GRN
262	RED
[illegible] 274	YEL
[illegible] 282	ORN
[illegible]-292	BLU
301 302	WHT AWG 24 600V
311 312	WHT BRN TR AWG 18 [illegible]
433 473	WIRE TINNED COPPER .020 DIA
480 482	CABLE, SHIELDED WHT RED
491 493	CABLE, SHIELDED WHT GRN
[illegible] 497	CABLE, SHIELDED WHT
551 578	SLVG. FIBERGLAS BLK .022 ID
591 597	SLVG FIBERGLAS BLK .034 ID
599	SLVG VINYL TRANSP 5/16 ID

NOTE:
FOR USE WITH 60 ∿ POWER SUPPLY LEAD 222 MUST BE REMOVED FROM CR 201-1 & CONNECTED TO K202 4.

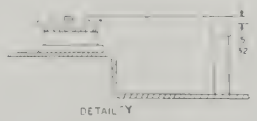


Figure 8-5A. Relay Assembly RE-134A/ARC-21, Connection Diagram

TABLE XL. MAINTENANCE CHECK LIST FOR RELAY ASSEMBLY RE-134A/ARC-21

I. VISUAL INSPECTION	
UNIT	CHECK FOR
Chassis, Components	dents, cracks, bent pins, stripped threads, corrosion, dirt discoloration, burned or deteriorated insulation, carefully check bases of sealed relays for cracks

II. ADJUSTMENT

		IN			OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
Audio Attenuator Switch S201	8-4	-	-	-	-	-	-	Set to prescribed position for particular installation (usually "3").
Bias Potentiometer R206	8-11	-	-	-	TS-375/U	J201	7.5V	Adjust R206 so that tuning cycle ends before timer runs out

e. If there is no sidetone when key is depressed check C208, K208 or V203. Shift to "VOICE" to check voice sidetone. If lacking check K208, K209, or C208.

8-5. Perform the tests given in table XXXVI. The cause for abnormal indications can be determined by employing the voltage chart given in table XXXIX. Make a functional check of relay K209 by applying 28 volts to the relay and making appropriate continuity checks of all its contacts. Repeat without voltage on the coil.

8-6. Defective components can be located by employing the resistance charts (tables XXXVII and XXXVIII) and the voltage chart (table XXXIX). Note that resistances are measured with the chassis removed from the system. Refer to figure 8-1 for tube locations.

8-7. Check all relay coil windings by reference to tabulated d-c resistance values on the schematic diagram figure 8-4, using a Multimeter TS-352/U.

8-8. For certain types of testing and voltage reading it may be necessary to apply power to the receiver-transmitter unit without initiating an automatic tuning cycle or automatic re-cycle. This can be accomplished by clipping the bus wire jumper loop connecting terminals 4 and 5 of relay K207. Do this in the base of Relay Assembly RE-134A/ARC-21 before turning the control switch on.

CAUTION

Reconnect the jumper loop across terminals 4 and 5 of relay K207 to put the unit into service for normal operation.

8-9. ADJUSTMENT AND CHECKS.

8-10. GENERAL. Paragraph 8-11 describes adjustment of bias potentiometer R206. Table XL is a maintenance check list summarizing maintenance procedure for this component. It lists inspection and adjustment procedures which will assure field maintenance personnel that the Relay Assembly RE-134A/ARC-21 meets minimum standards of performance. The table may also be used as a guide to the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

8-11. SETTING BIAS POTENTIOMETER R206. Use the following procedure:

a. Mount all chassis in the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Set clutch release to "MANUAL." Remove damping spring from end of tuning support (the rack) on Amplifier-Oscillator AM-776A/ARC-21.

b. Select a channel near 10.5 megacycles, band 3.

c. Connect the Voltmeter TS-375/U to major test point 8, jack J201, pin J and ground. Set for +12 scale and use the d-c probe. This meter will have to be changed to pin c and back again as adjustment progresses. Two voltmeters are desirable if available.

d. Turn on the equipment and allow sufficient time for warmup.

e. Start the tuning sequence by turning channel selector to the frequency near 10.5 megacycles. The tuning will scan and trigger the thyratron clutch control V201. Tuning will stay at this point since the clutch release is set at "MANUAL."

f. Adjust resistor R206 for a reading of approximately 8 volts.

g. With voltmeter on pin J of major test point 8, center tuning manually for a reading of 7.5 volts.

h. Change voltmeter to pin C. Turn resistor R206 to increase voltage until the tuning motor is heard reversing. This will occur at approximately 9.6 volts.

i. Slowly decrease voltage, by adjusting R206, until the tuning cycle ends. This cycle must end by the operation of relay K202 through the bias adjustment of resistor R206 and not by the timer running out. Replace damping spring on the Amplifier-Oscillator AM-776A/ARC-21.

j. Change the voltmeter to pin J of major test point 8 and return clutch release to "AUTOMATIC."

k. Check operation by tuning several frequencies and noting the voltmeter reading. Make slight readjustment of resistor R206, as required, to obtain a reading of 7.5 volts.

l. Remove the voltmeter.

NOTE

Selenium rectifier CR201 prevents further tuning of the receiver-transmitter if the a-c source fails. Check the rectifier by measuring front-to-back resistance values.

SECTION IX

MAINTENANCE INSTRUCTIONS FOR RELAY ASSEMBLY RE-136A/ARC-21

9-1. TROUBLE ANALYSIS.

9-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

9-3. This chassis contains the relays necessary to control the homing, scanning, tuning and loading functions in the Amplifier, Radio Frequency AM-774A/ARC-21.

9-4. The quickest method of checking a defective chassis is to use a Multimeter TS-352/U and check all relay windings for correct d-c resistance as given in the tabulation on the schematic diagram, figure 9-2. Replace any relay showing more than 15 percent deviation from design value.

9-5. Tables XLI and XLII give the resistances from plug pins to ground and relay terminals to ground respectively.

TABLE XLI. RESISTANCE IN OHMS, PLUG P301 AND JACK J302 PINS TO GROUND

Pin	A	B	C	D	E	F	H	J	K	L
P301	*	*	*	*	245	*	*	*	*	645
J302	*	*	*	*	*	*	*	*	0	*
Pin	M	N	P	R	S	T	U	V	W	X
P301	245	*	*	*	*	*	*	*	*	*
J302	*	*	245	*	0	*	0	*	*	*
Pin	Y	Z	AA	BB	CC	DD	EE	FF	HH	JJ
P301	*	0	*	*	*	*	*	*	*	*
J302	*	*	*	*	*	*	0	*	*	*
Pin	KK	LL	MM	NN						
P301	*	*	*	*						
J302	*	*	*	*						

* Infinite resistance value.

TABLE XLII. RESISTANCE IN OHMS, FROM RELAY TERMINALS TO GROUND

Relay	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
K301	*	*	0	0	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K302	*	*	*	*	*	*	*	0	*	*	*	*	*	*	-	-	-	-	-	-
K303	*	*	*	*	*	*	*	0	*	*	*	*	*	*	-	-	-	-	-	-
K304	*	*	*	*	*	*	*	*	0	*	*	0	*	0	-	-	-	-	-	-
K305	*	0	*	0	*	*	*	*	0	*	*	245	0	0	-	-	-	-	-	-
K306	0	0	*	0	*	*	*	*	0	245	0	*	*	0	-	-	-	-	-	-
K307	*	0	*	*	*	*	*	*	*	*	0	*	*	*	-	-	-	-	-	-
K308	545	245	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
K309	245	*	*	245	*	*	*	0	490	490	*	*	*	490	-	-	-	-	-	-
K310	*	*	*	*	245	0	0	*	2700	2700	*	-	-	-	-	-	-	-	-	-
K311	*	*	*	*	245	*	*	*	0	0	*	*	*	*	-	-	-	-	-	-
K312	*	*	*	*	245	*	*	*	*	*	*	*	*	*	-	-	-	-	-	-
K313	*	*	0	*	0	*	0	*	0	*	*	*	0	0	-	-	-	-	-	-
K314	*	*	*	*	*	*	*	*	0	*	*	*	0	0	-	-	-	-	-	-
K315	0	300	*	*	245	245	380	*	*	*	300	0	*	0	-	-	-	-	-	-
K316	*	545	*	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-	-
K317	0	300	*	245	*	245	*	*	*	245	300	*	*	*	-	-	-	-	-	-
K318	*	*	*	0	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-
K319	*	0	490	490	*	*	*	*	-	-	-	-	-	-	-	-	-	-	-	-

* Infinite resistance value.

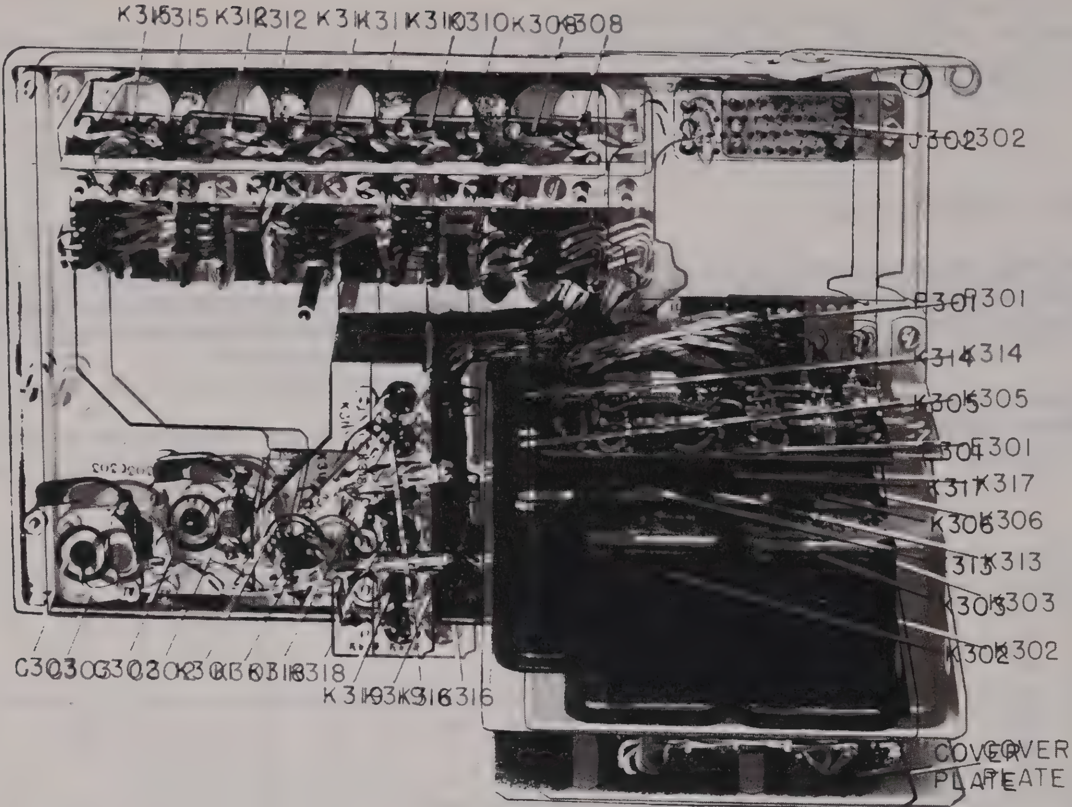

K315
K312
K311
K310
K308
J302
P301
K314
K305
E301
K317
K306
K313
K303
K302
COVER PLATE
C303
C302
K318
K319
K316

Figure 9-1. Relay Assembly RE-136A/ARC-21, Top

9-6. OPERATION CHECK.

9-7. If relay windings are not defective or repairs are made, insert the unit into position in the frame of the Receiver-Transmitter RT-128A/ARC-21 in the test setup for an operation check.

9-8. After any defects found in the previous checks have been corrected, an operating test can be performed as follows:

a. With the chassis cabled into the test setup, set controls on radio set control for "CW" operation, "POWER" at "LOW", and "CONTROL" at "ON." Select a channel in the range of 2.2 to 3.5 megacycles.

b. Allow equipment to warm up and tune.

c. Initiate a tuning sequence of the Amplifier, Radio Frequency AM-474A/ARC-21 and observe the operation of the unit.

9-9. Trouble traced to a group of relays may be due to broken leads or defective contacts in the relays.

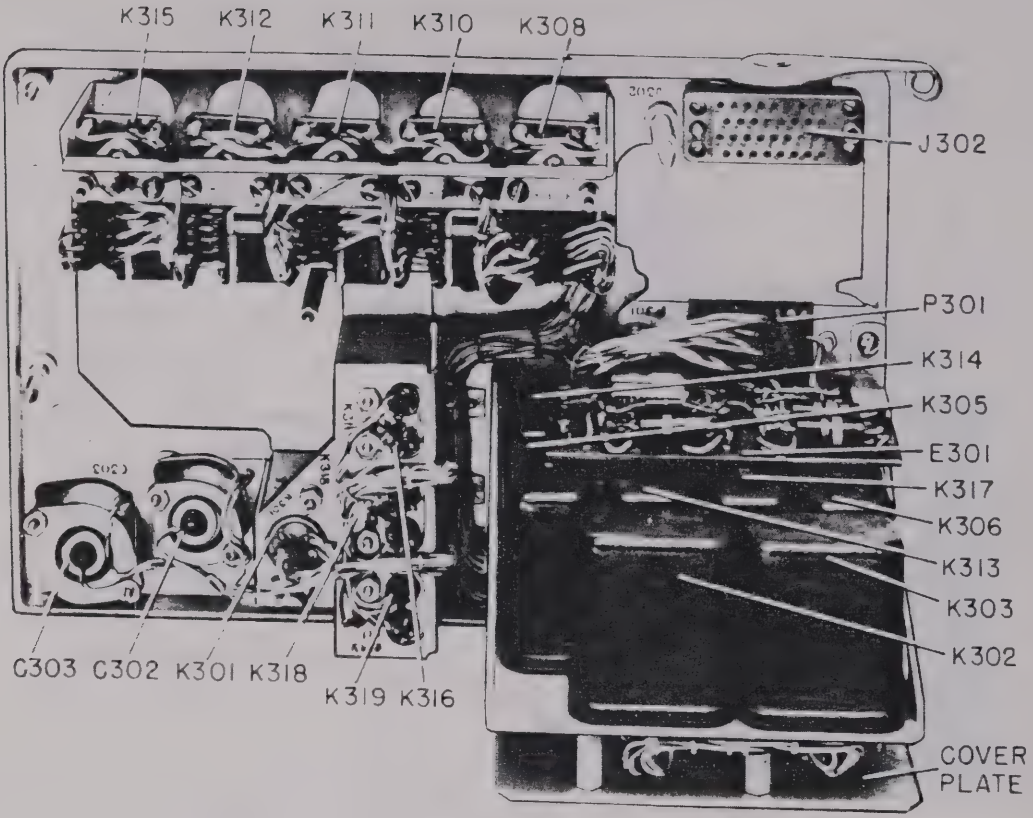

K315
K312
K311
K310
K308
J302
P301
K314
K305
E301
K317
K306
K313
K303
K302
COVER PLATE
C303
C302
K301
K318
K319
K316

Figure 9-1. Relay Assembly RE-136A/ARC-21, Top

9-6. OPERATION CHECK.

9-7. If relay windings are not defective or repairs are made, insert the unit into position in the frame of the Receiver-Transmitter RT-128A/ARC-21 in the test setup for an operation check.

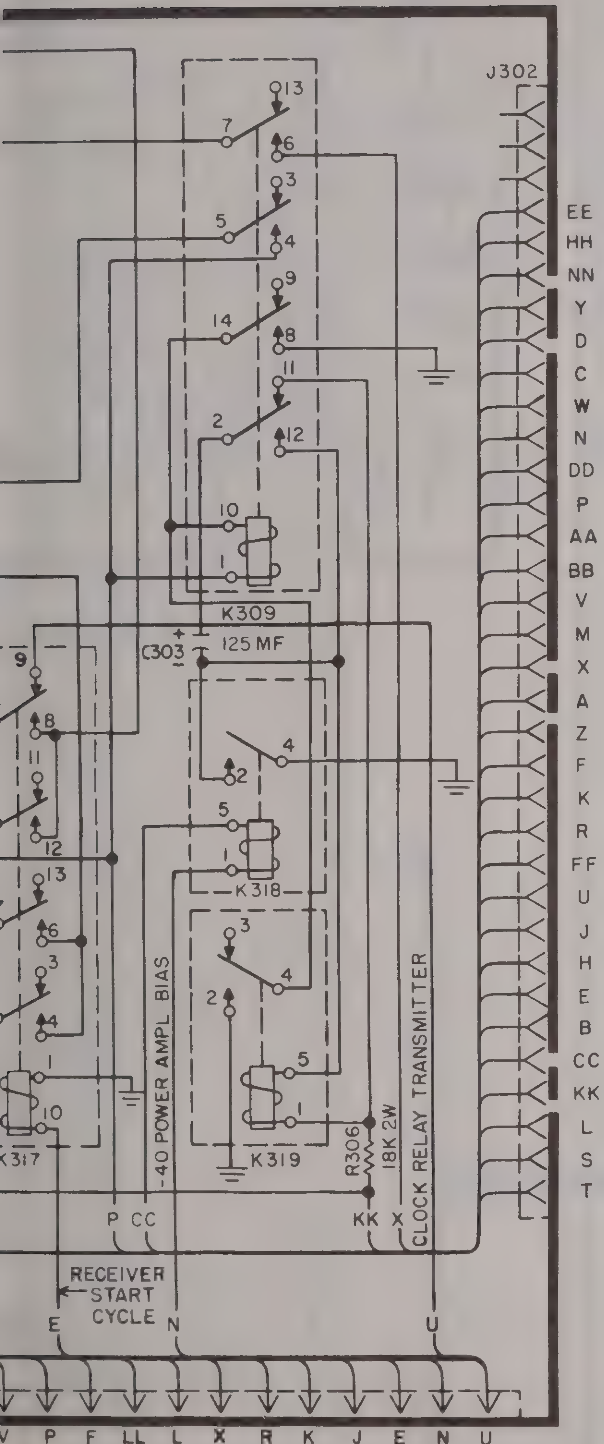
9-8. After any defects found in the previous checks have been corrected, an operating test can be performed as follows:

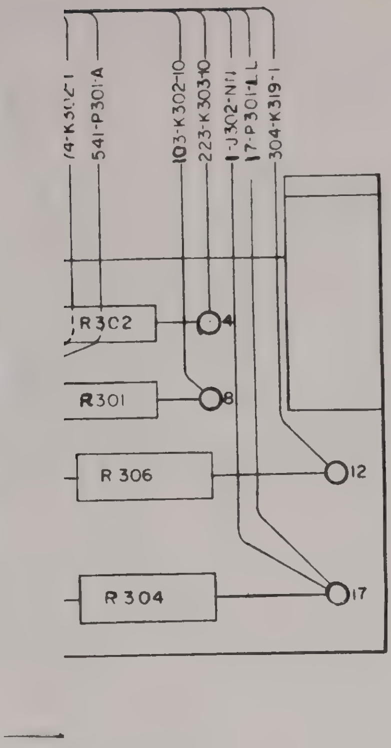
a. With the chassis cabled into the test setup, set controls on radio set control for "CW" operation, "POWER" at "LOW", and "CONTROL" at "ON." Select a channel in the range of 2.2 to 3.5 megacycles.

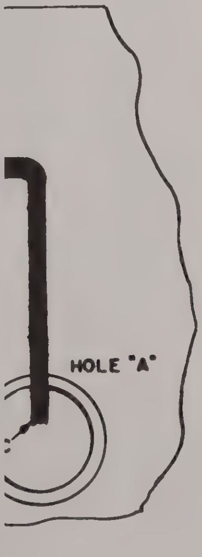
b. Allow equipment to warm up and tune.

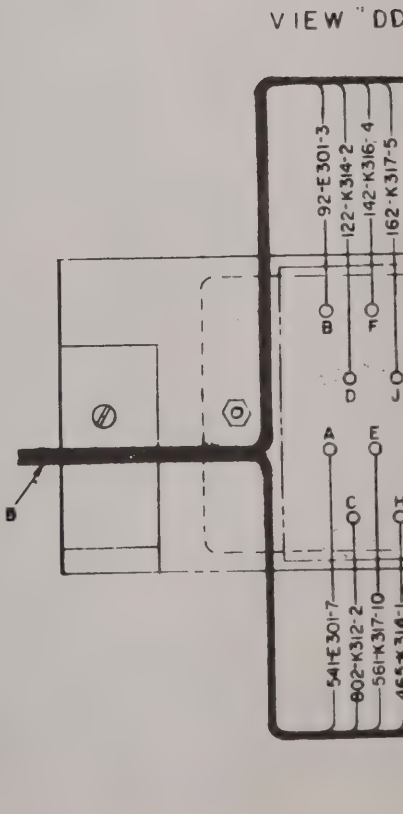
c. Initiate a tuning sequence of the Amplifier, Radio Frequency AM-774A/ARC-21 and observe the operation of the unit.

9-9. Trouble traced to a group of relays may be due to broken leads or defective contacts in the relays.


J302
EE
HH
NN
Y
D
C
W
N
DD
P
AA
BB
V
M
X
A
Z
F
K
R
FF
U
J
H
E
B
CC
KK
L
S
T
K309
C303
125 MF
K318
K319
K317
R306
18K 2W
-40 POWER AMPL BIAS
CLOCK RELAY TRANSMITTER
P CC
KK X
RECEIVER START CYCLE
E
N
U
V P F LL L X R K J E N U


74-K302-1
541-P301-A
103-K302-10
223-K303-10
1-J302-NN
17-P301-LL
304-K319-1
R302
R301
R 306
R 304
4
8
12
17




VIEW "DD
92-E301-3
122-K314-2
142-K316-4
162-K317-5
B
F
D
A
E
C
B
541-E301-7
802-K312-2
561-K317-10

C-21, Schematic Diagram

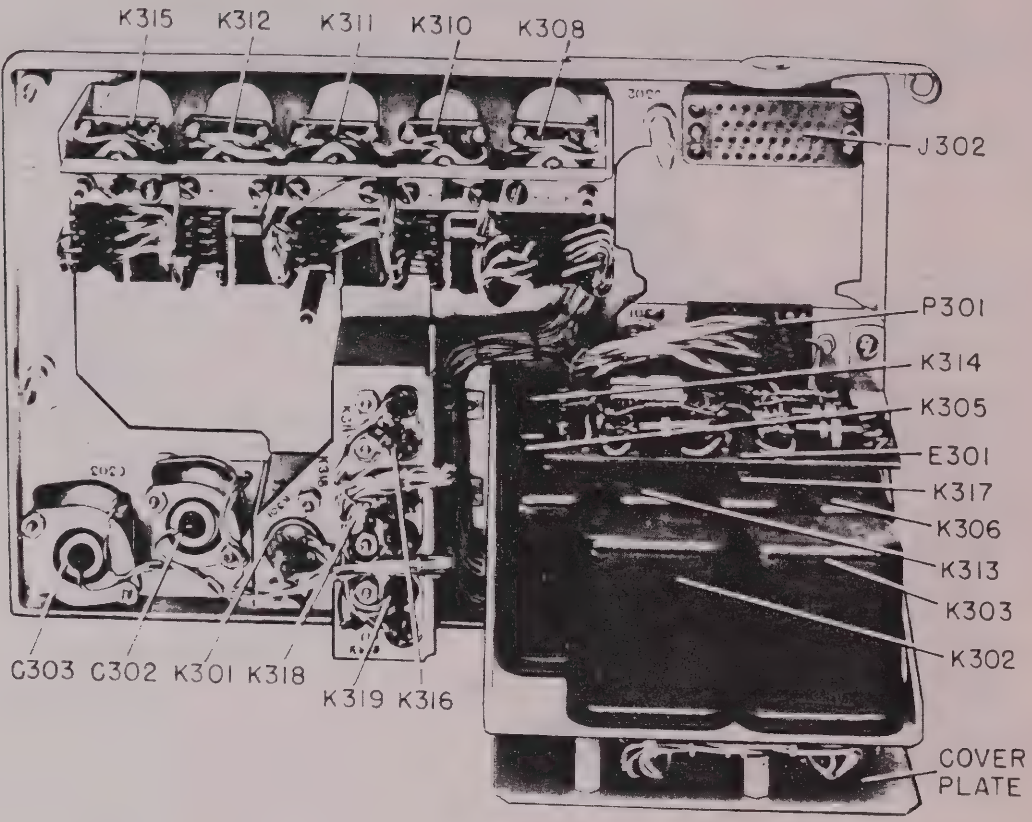

K315
K312
K311
K310
K308
J302
P301
K314
K305
E301
K317
K306
K313
K303
K302
COVER PLATE
C303
C302
K301
K318
K319
K316

Figure 9-1. Relay Assembly RE-136A/ARC-21, Top

9-6. OPERATION CHECK.

9-7. If relay windings are not defective or repairs are made, insert the unit into position in the frame of the Receiver-Transmitter RT-128A/ARC-21 in the test setup for an operation check.

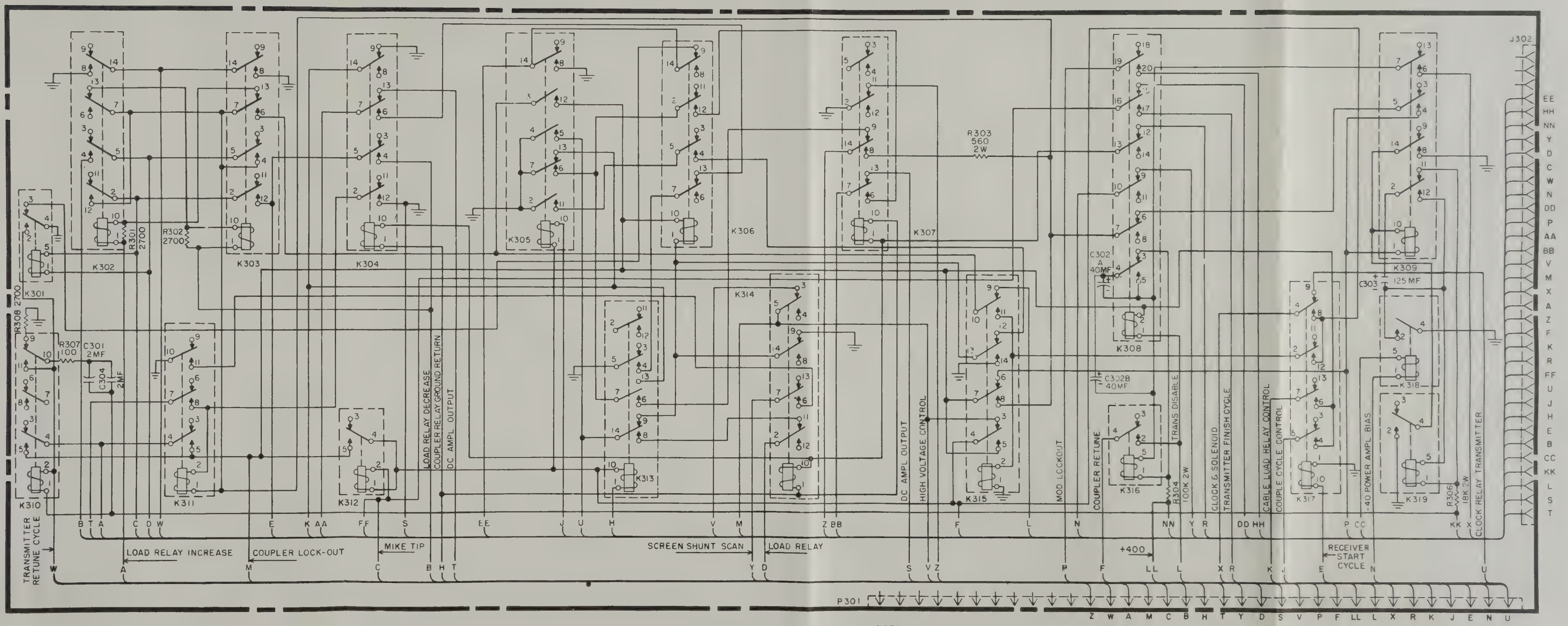
9-8. After any defects found in the previous checks have been corrected, an operating test can be performed as follows:

a. With the chassis cabled into the test setup, set controls on radio set control for "CW" operation, "POWER" at "LOW", and "CONTROL" at "ON." Select a channel in the range of 2.2 to 3.5 megacycles.

b. Allow equipment to warm up and tune.

c. Initiate a tuning sequence of the Amplifier, Radio Frequency AM-774A/ARC-21 and observe the operation of the unit.

9-9. Trouble traced to a group of relays may be due to broken leads or defective contacts in the relays.


J302
K301
K302
K303
K304
K305
K306
K307
K308
K309
K310
K311
K312
K313
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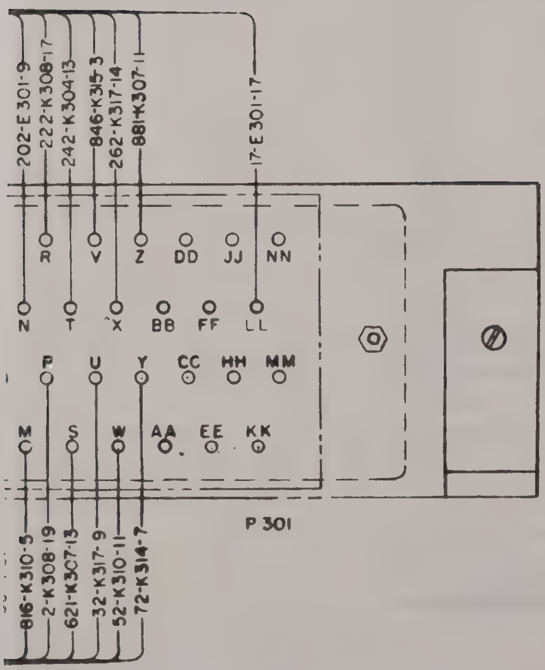
K315
K316
K317
K318
K319
R301 2700
R302 2700
R303 560 2W
R304 100K 2W
R306 18K 2W
R307 100
R308 2700
C301 2MF
C302 A 40MF
C302B 40MF
C303 125 MF
C304 2MF
TRANSMITTER RETUNE CYCLE
LOAD RELAY INCREASE
COUPLER LOCK-OUT
MIKE TIP
LOAD RELAY DECREASE
COUPLER RELAY GROUND RETURN
DC AMPL OUTPUT
SCREEN SHUNT SCAN
LOAD RELAY
DC AMPL OUTPUT
HIGH VOLTAGE CONTROL
MOD LOCKOUT
COUPLER RETUNE
+400
TRANS DISABLE
CLOCK & SOLENOID
TRANSMITTER FINISH CYCLE
CABLE LOAD RELAY CONTROL
COUPLE CYCLE CONTROL
RECEIVER START CYCLE
-40 POWER AMPL BIAS
CLOCK RELAY TRANSMITTER
P301
EE HH NN Y D C W N DD P AA BB V M X A Z F K R FF U J H E B CC KK L S T
Z W A M C B H T Y D S V P F LL L X R K J E N U

NOTE I
ALL RESISTORS 1/2 WATT
UNLESS OTHERWISE SHOWN.

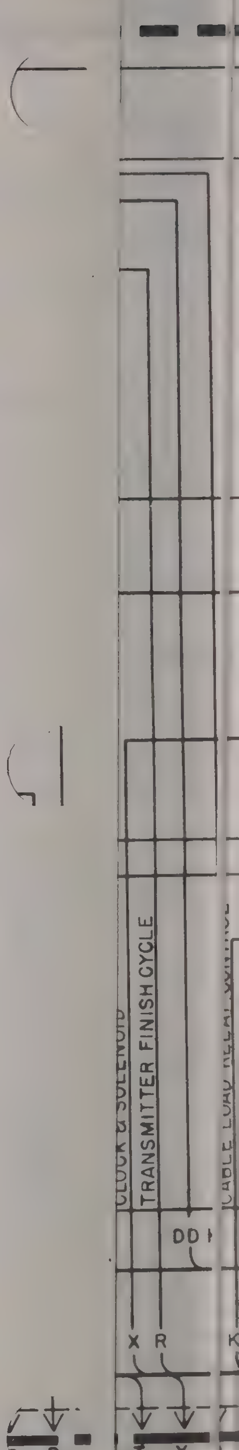
Figure 9-2. Relay Assembly RE-136A/ARC-21, Schematic Diagram


202-E301-9
222-K308-17
242-K304-13
846-K315-3
262-K317-14
881-K307-11
17-E301-17
R
V
Z
DD
JJ
NN
N
T
X
BB
FF
LL
P
U
Y
CC
HH
MM
M
S
W
AA
EE
KK
816-K310-5
2-K308-19
621-K307-13
32-K317-9
52-K310-11
72-K314-7

P 301

WIRE TABLE

WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND	CONDUCTOR
1—18	WHT BLK TR	7/.008
31—33	BLU	
51—59	GRN	
71—74	RED	
91—98	YEL	
101—103, 118	BRN	
121—126	ORN TR	
141—144	BLK / BRN TR	
161—164	BLK / RED	
182—188	BLK / GRN	
201—207	BRN / RED	
221—224	BRN / GRN	
241—243	BRN / BLU	
261-263	RED / BLK	
281-283	RED / GRN	
301-304	RED / BLU	
321-325	YEL / BLK	
341-343	YEL / RED	
363	YEL / GRN	
381-383	GRN / BLK	
401-403	GRN / BRN	
421-423	GRN / RED	
441-444	BLU / BRN	
461-465	BLU / RED	
481-484	BLU / BLK TR	
521-527	RED / GRN / BLK TR	
541-543	YEL / RED / BLK	
561-564	YEL / GRN / BLK	
581	GRN / BRN / BLK	
601-603	GRN / RED / BLK	
621-623	BRN / RED / BLK TR	7/.008
802-804	BLK TR	16/.010
816-821	GRN	
831	YEL	
845 847	WHT	
860-861	RED	16/.010
870-871	RED	10/.010
880-881	WHT RED/BLU TR	10/.010
921-946	TIN COP	.025 DIA
975-992	TUBING INSULATING BLK	.034 ID
1125-1128	TUBING INSULATING BLK	.148 ID


CLOCK & SOLENOID
TRANSMITTER FINISH CYCLE
DD
X
R
K
B
T
Y

bly RE-36

SECTION X

MAINTENANCE INSTRUCTIONS FOR AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21

10-1. GENERAL.

10-2. The primary function of this chassis is to provide the r-f power amplification by means of tubes V401 and V402 for the transmitter portion of the equipment. This is the modulated stage for voice transmission. In addition to the power amplifier circuits, it contains the servo and dynamotor delay circuits. Tube V403 is part of a delay circuit to keep the high-voltage dynamotors running, in cw operation, for about four seconds after the last character is transmitted. Two other tubes V404 and V405 control the transfer of the tuning functions as tuning is completed. In addition, servo circuits set up the proper values for frequencies involved and control the tuning operation.

10-3. TROUBLE ANALYSIS.

10-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means. Defects in the tuning mechanism and tuning control circuits are the most frequent cause of improper operation of the unit. For this reason the first steps in locating trouble is to carefully clean and examine the unit for loose, broken or damaged parts.

WARNING

> High voltages are employed in this unit which should not be adjusted with power on. Keep clear while observing operation.

10-5. With any obvious defect corrected, connect the chassis into the test setup and cycle the unit through a complete tuning sequence several times as a check on functioning. See paragraph 10-15 for procedure.

10-6. Measure both high and low output power to check operation of V401, V402 circuits.

10-7. When the tuning mechanism fails to function as described in paragraph 10-15, it will be necessary to carefully analyze the symptoms of improper operation. Assuming no mechanical difficulties, the defect would be in the motors or relays. Check V401, V402 circuit if power output is incorrect.

TABLE XLIII. TROUBLE ANALYSIS, AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 10-6

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	3 (J403)	Multimeter ME-75/ARC-21 plug into jack. Selector switch at position 1	Radio Set Control C-451/ARC-21 set for "VOICE" operation, "POWER" at "HI," "CONTROL" at "ON." Press microphone button for transmit	20 to 35 ma transmit (Grid drive on V401, V402)	R427, L401, R401, C401, R403 and C407, V401 and V402, or E401
2	3 (J403)	Selector switch at position 2*	Same as step 1 except release microphone button	0 transmit 50 volts tuning or receiving (Plate current of transfer control V405)	Absence of +120-volt supply, short circuit, or V405. Zero condition function of V404 and V405
3	3 (J403)	Selector switch at position 4	Same as step 1	220 to 270 volts transmit	V401, V402, C402, C403

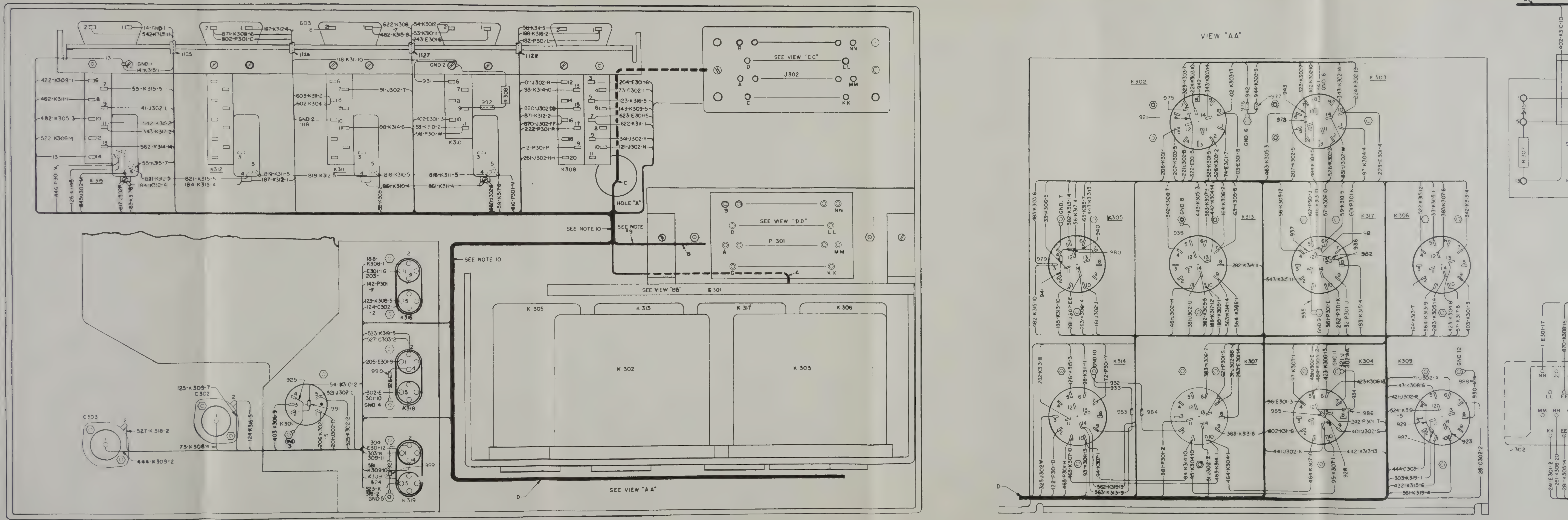
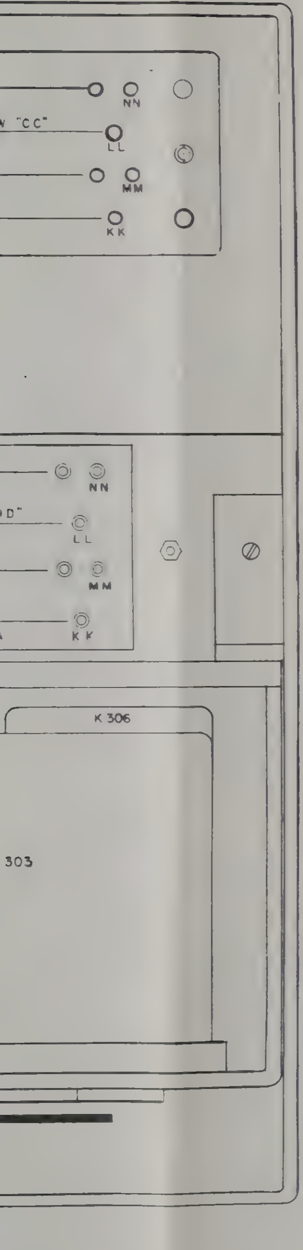
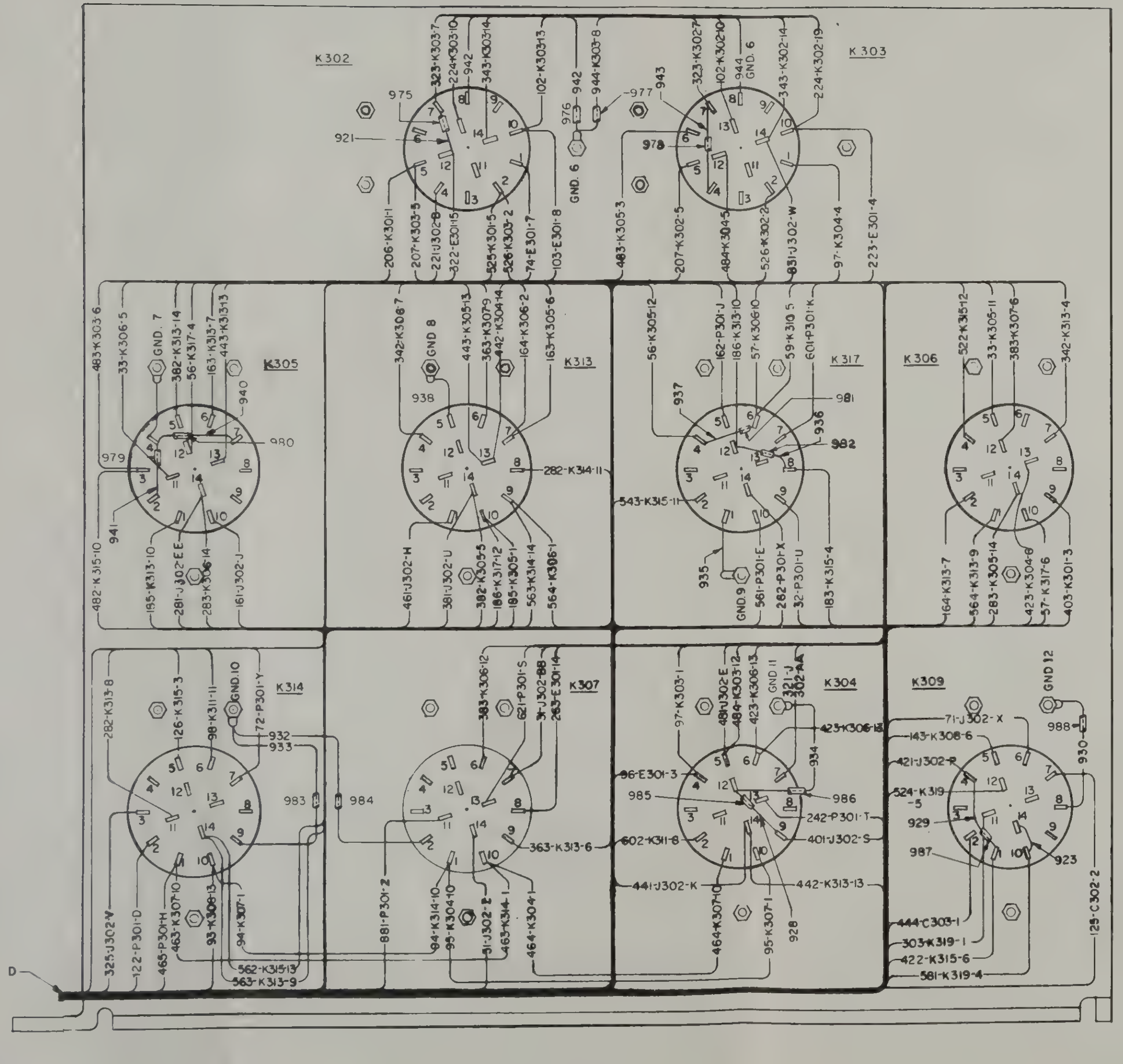

VIEW "AA"
K302
K303
K305
K313
K317
K306
K314
K307
K304
K309
K 305
K 313
K 317
K 306
K 302
K 303
K312
K311
K310
K308
K315
K316
K318
K319
K301
C302
C303
R308
R 307
J302
J 302
P 301
E 301
SEE VIEW "CC"
SEE VIEW "DD"
SEE VIEW "BB"
SEE VIEW "A A"
SEE NOTE 10
SEE NOTE 9
HOLE "A"
1125
1126
1127
1128
GND 2
GND 4
GND 5
NN
LL
MM
KK
A
B
C
D

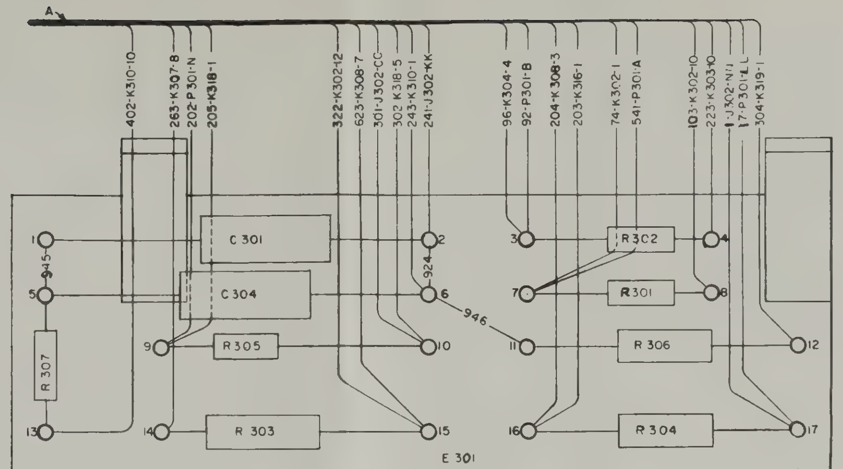
Figure 9-3. Relay Assembly RE-136A/ARC-21, Connection Diagram


NN
"CC"
LL
MM
KK
NN
"D"
LL
MM
KK
K 306
303

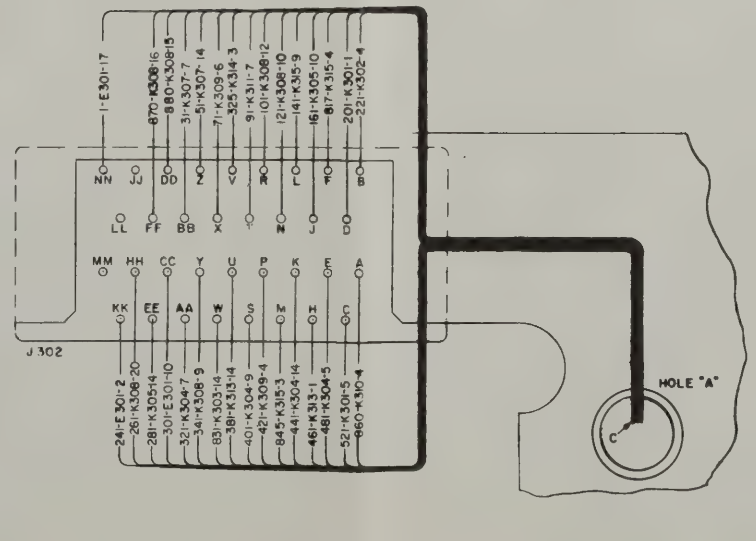
VIEW "AA"


K302
K 303
K305
K313
K317
K 306
K314
K307
K304
K309
GND 6
GND 7
GND 8
GND 9
GND 10
GND 11
GND 12
D

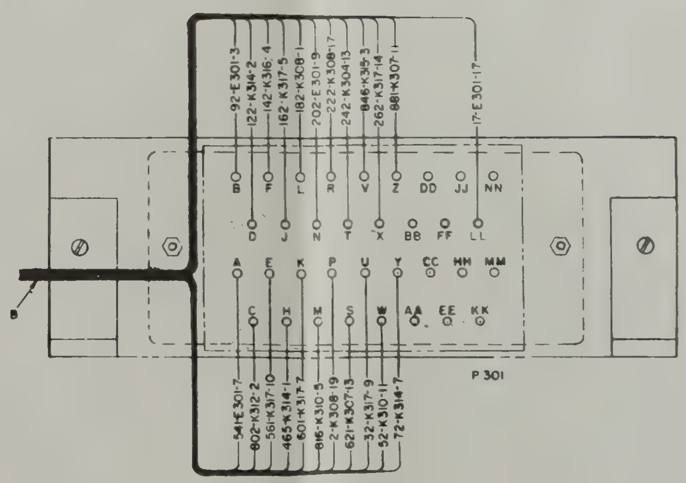
VIEW "BB"


A
C 301
C 304
R305
R 303
R 307
R302
R301
R 306
R 304
E 301
946

VIEW "CC"


J 302
HOLE "A"
C

VIEW "DD"



WIRE TABLE		
WIRE NO (INCLUSIVE)	DESCRIPTION	
	COLOR AND	CONDUCTOR
1 — 18	WHT BLK TR	7/.008
31 — 33	BLU	
51 — 59	GRN	
71 — 74	RED	
91 — 98	YEL	
101—103, 118	BRN	
121 — 126	ORN TR	
141 — 144	BLK / BRN TR	
161 — 164	BLK / RED	
182 — 188	BLK / GRN	
201 — 207	BRN / RED	
22 — 224	BRN / GRN	
241 — 243	BRN / BLU	
261 — 263	RED / BLK	
281 — 283	RED / GRN	
301 — 304	RED / BLU	
32 — 325	YEL / BLK	
341 — 343	YEL / RED	
363	YEL / GRN	
381 — 383	GRN / BLK	
401 — 403	GRN / BRN	
421 — 423	GRN RED	
441 — 444	BLU / BRN	
461 — 465	BLU / RED	
481 — 484	BLU / BLK TR	
521 — 527	RED / GRN / BLK TR	
541 — 543	YEL / RED / BLK	
561 - 564	YEL / GRN / BLK	
581	GRN / BRN / BLK	
601 — 603	GRN / RED / BLK	
621 — 623	BRN / RED / BLK TR	7/.008
802-804	BLK TR	16/010
816-821	GRN	
831	YEL	
845 847	WHT	
860-861	RED	16/010
870-871	RED	10/.010
880-881	WHT RED/BLU TR	10/.010
921-946	TIN COP	.025DIA
975-992	TUBING INSULATING BLK	.034ID
1125-1128	TUBING INSULATING BLK	.148ID

TABLE XLIII. TROUBLE ANALYSIS, AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21 (continued)

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
3			"POWER" switch at "LOW"	110 to 170 volts transmit (Screen grid voltage)	
4	3 (J403)	Selector switch at position 5	Same as step 1	+120 volts (Plate supply)	Wiring
5	3 (J403)	Selector switch at position 6. Use position 10 for ac	Same as step 1	13.5 volts ac (Fil. supply)	Short or open filament
6	3 (J403)	Selector switch at position 7	Press microphone button	-45 volts transmit (fixed Bias supply, pin 4 of V401, V402)	Wiring

* Use R-F Probe ID-263/U to indicate rf on coil L403 as it passes through resonance position.

TABLE XLIV. RESISTANCE, IN OHMS, FROM PINS OF PLUGS P401 AND P402 TO GROUND

Pin	A	B	C	D	E	F	H	J	K	L
P401	0.4	**	**	31,000	**	**	**	0	**	**
P402	3.5	0	**	**	**	**	0	**	**	500
Pin	M	N	P	R	S	T	U	V	W	X
P401	0	0	580	**	0	0	75	**	**	**
P402	**	**	37	0	0	0	*2 meg	**	23	0
Pin	Y	Z		AA	BB	CC	DD	EE	FF	HH
P401	**	**		**	**	**	**	**	**	**
P402	**	**		**	**	**	**	41	**	**
Pin	JJ	KK	LL	MM						
P401	**	**	**	**						
P402	**	**	**	**						

* Indicates increasing resistance due to capacitor charge.
** Infinite resistance value.

10-8. Follow the procedure in table XLIII where abnormal meter indications will serve to indicate the circuit at fault. The defect can be located either by employing a voltage and resistance check of the circuit by reference to tables XLIV through XLVI by checking circuit items by reference to the schematic diagram, figure 10-5. Figure 10-1 shows tube locations.

10-9. Table XLVII lists the relays that may be at fault with various types of troubles. Relays may be checked by reference to schematic diagram, figure 10-5. If relays show no defects, motors should be checked for operation and replaced if necessary. Table XLVIII is a list of switches and the circuits they control.

10-10. Proper tuning of the transmitter depends upon the correct functioning of several timing circuits in the Relay Assembly RE-136A/ARC-21. Faulty operation of the slow-release relay K310 or the slow-operate relay K308 will cause a premature shut-down of the tuning motor B401. This shutdown will result in low power output and excessive plate dissipation of tubes V401 and V402 when in the high-power position. Relay K308 derives its slow-release operation from capacitors C301 and C304. This slow-operate function of relay K308 is determined by capacitor C302, resistor R304, and relay K316. These components should be checked for proper values.

10-11. If on subsequent operation of the mike button or key, after the transmitter has been properly tuned

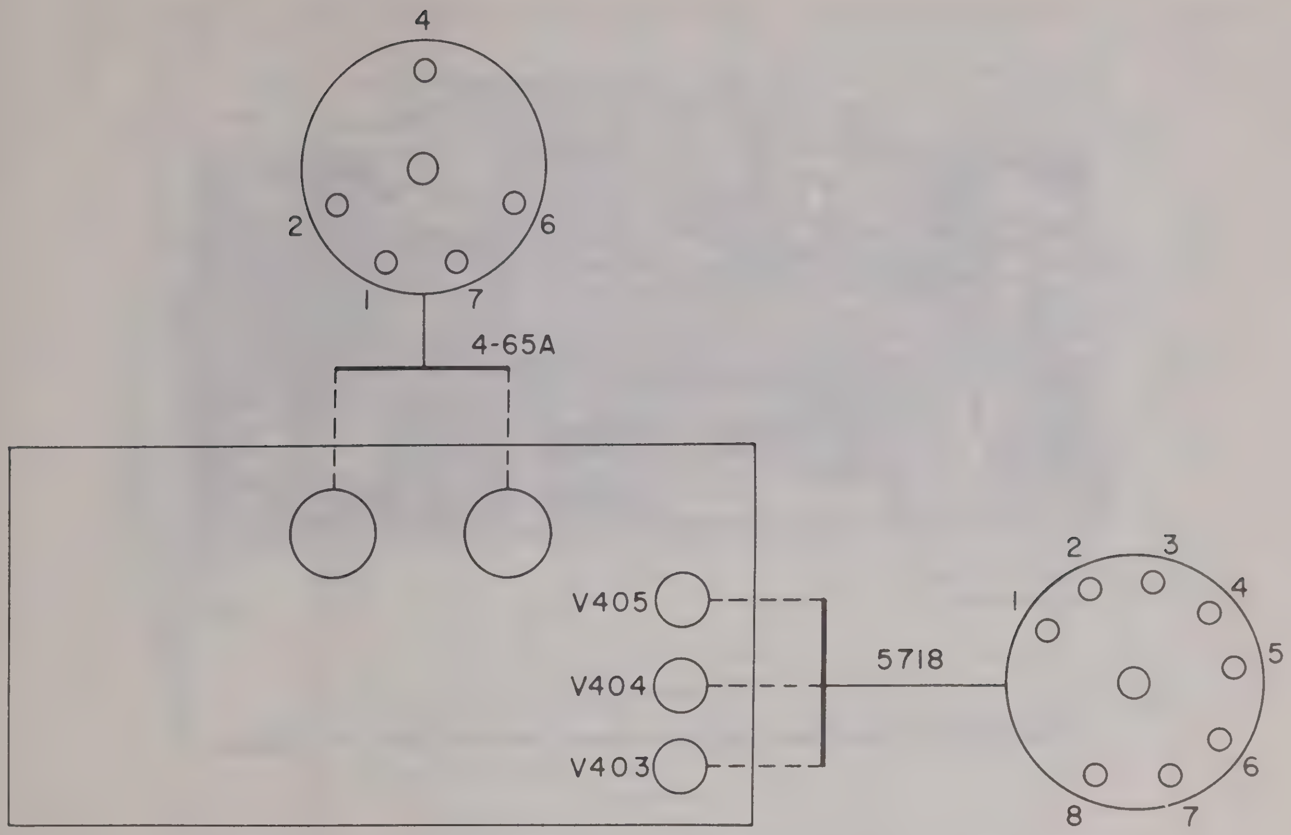


Figure 10-1. Amplifier, Radio Frequency AM-774A/ARC-21, Tube Locations

TABLE XLV. VOLTAGE CHART, AMPLIFIER, RADIO FREQUENCY AM-744A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Multimeter TS-352/U.
Test Conditions: Chassis on bench connected to receiver-transmitter chassis by test cables. Receive condition.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V401	-4-65A	Do not measure							
V402	-4-65A	Do not measure							
V403	-5718	7.95	-	6.7	-	-	-	0	117
V404	-5718	0	-	19.2	0	-	13	0	0
V405	-5718	3.5	-	13	-	0	6.8	-	62

TABLE XLVI. RESISTANCE CHART, AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21

All resistance in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Test Conditions: All cables disconnected. Checks made with chassis on bench.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V401	-4-65A	0	*	*	*	*	*	0	-
V402	-4-65A	0.5	*	*	*	*	*	0	-
V403	-5718	40k	*	9	*	0	0	*	*
V404	-5718	*	*	24	*	*	16	*	*
V405	-5718	*	*	16	*	0	9	*	*

* Infinite resistance value.

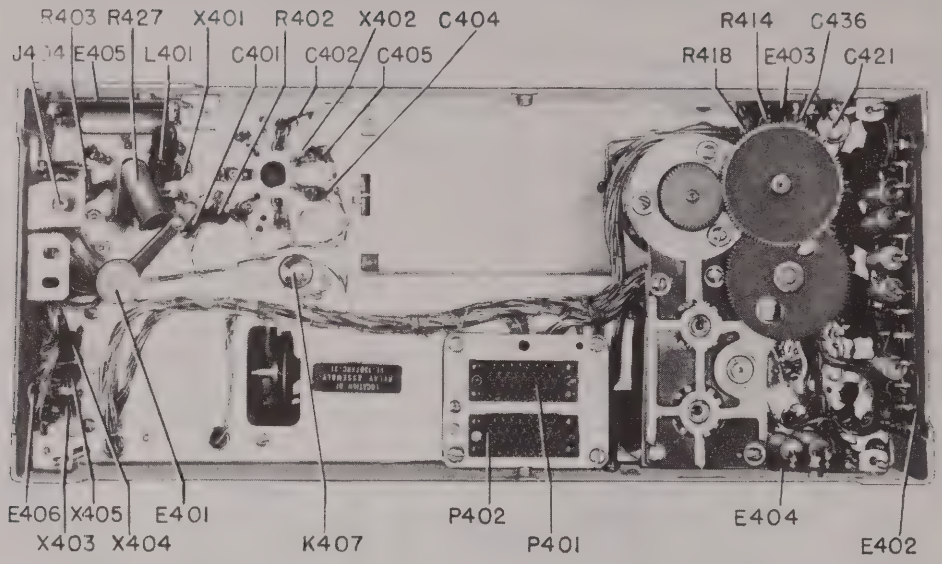

R403
R427
X401
R402
X402
C404
J404
E405
L401
C401
C402
C405
R414
C436
R418
E403
C421
E406
X405
E401
X403
X404
K407
P402
P401
E404
E402

Figure 10-2. Amplifier, Radio Frequency AM-774A/ARC-21, Bottom

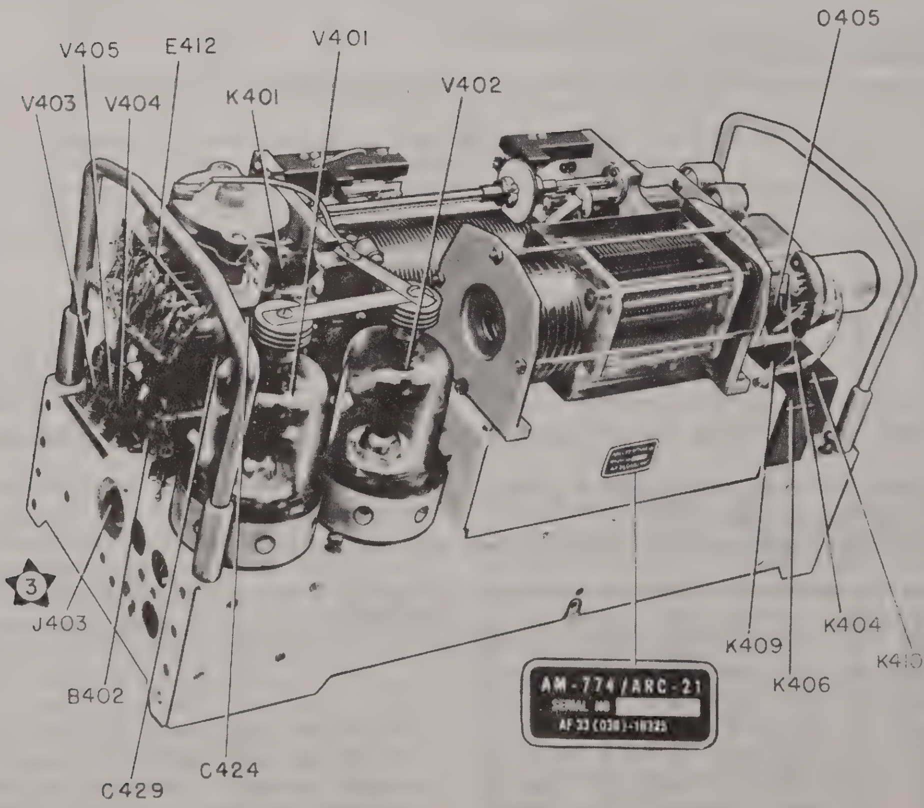

V405
E412
V401
0405
V403
V404
K401
V402
3
J403
B402
C429
C424
AM-774/ARC-21
SERIAL NO
AF 33 (038)-18325
K409
K404
K406
K410

Figure 10-3. Amplifier, Radio Frequency AM-774A/ARC-21, Left Side

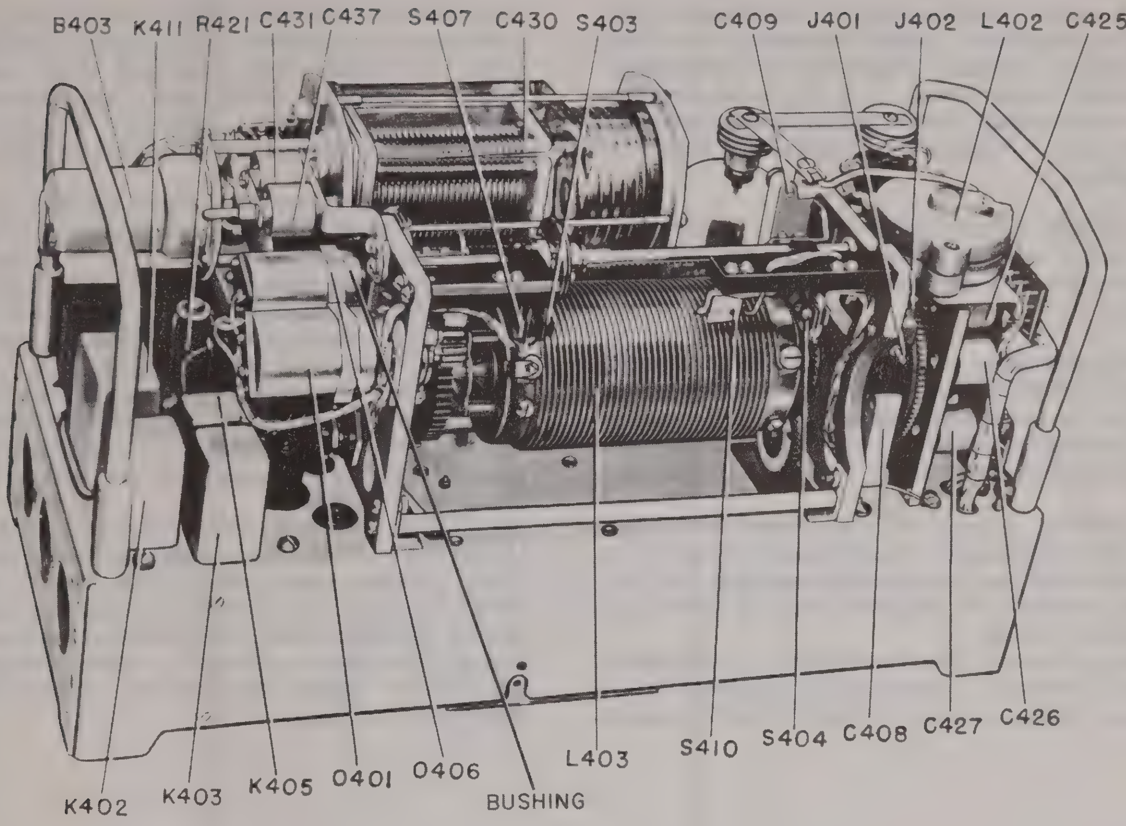


Figure 10-4. Amplifier, Radio Frequency AM-774A/ARC-21, Right Side

and loaded, the tuning coil L403 starts to scan, it is indicative of improper operation of the slow-operate relay K310 or the slow-operate relay K308 will cause a pre-R105 and R106. The adjustment of resistors R105 and R106 should be checked by the method previously outlined. The slow-operate function of relay K309 is determined by relay K319, capacitor C303, and resistor R306. Check these components.

10-12. In the "CW" position the operation of the transmitter power supply is dependent upon relay K402 located in the Amplifier, Radio Frequency AM-774A/ARC-21. This relay derives an approximate 4-second release delay from the vacuum tube circuit including tube V403, resistors R405, R406, and R407, and capacitor C411. A complete failure of this circuit will prevent the transmitter from tuning in the "CW" position. A failure of the capacitor C411 will permit relay K402 either to follow keying or to remain energized continuously.

10-13. ADJUSTMENTS AND CHECKS.

10-14. GENERAL. Paragraphs 10-15 through 10-17 describe a final operational check to verify correct operation of a repaired Amplifier, Radio Frequency AM-774A/ARC-21, and outline inspection and lubrication procedures. There are no adjustments. All relays are sealed, and the critically aligned mechanical components cannot be adjusted at the field maintenance level.

10-15. Table XLIX is a maintenance check list summarizing maintenance procedures for this component.

TABLE XLVII. RELAY TROUBLE CHART, AMPLIFIER, RADIO FREQUENCY AM-744A/ARC-21

Operation Defect	Relays Probably at Fault
Will not home (B401 not running)	K403
Homes but fails to scan on voice or "FSK"	K411
on "CW"	K411, K402
Inability to modulate	K406, K410
Scans but fails to tune	K401, K403, K404, K405, K407, K410
Failure to start in cw	K402, K411
Fails to tune after releasing microphone button	K407
Failure of ratchet motor B402 to operate	K409

It lists tests that will assure field maintenance personnel that Amplifier, Radio Frequency AM-774A/ARC-21 meets minimum standards of performance. The table may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

10-16. TUNING MECHANISM CHECK. Install the chassis in the unit and cycle the unit through a complete tuning sequence several times as a check on the functioning.

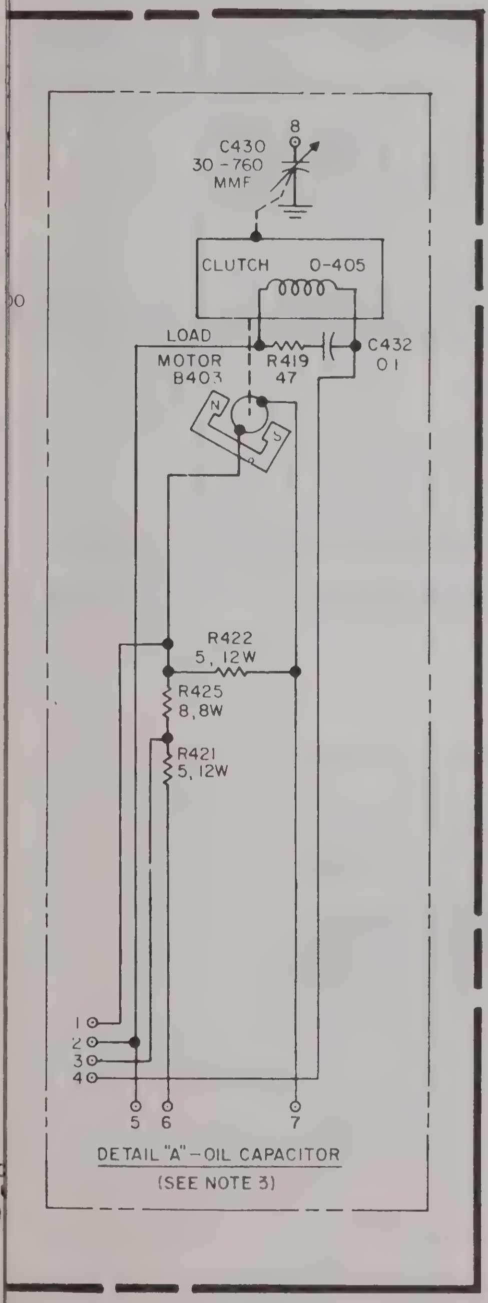
10-17. Set controls on Radio Set Control for "VOICE" operation, "POWER" at "HI", and "CONTROL" at "ON." Set up frequency control for 5.0 mc on one channel. Switch the equipment to this channel and observe the operation carefully for the following sequence:

a. Band Setting: occurs when equipment is switched on or the channel changed. Ratchet motor B402 drives capacitor setting and function switches S406 and S411 to proper position for frequency band if other than previous band setting.

b. Homing: occurs after band setting is completed. Brake O401 released, clutch O402 engaged. Motor B401 drives roller on plate tuning coil L403 to maximum inductance of home position at high speed. When L403 homes, clutch O402 is released, brake O401 applied, and motor B401 continues to run until C430 homes. Capacitor C430 homes simultaneously with coil L403 to maximum capacity. Capacitor C430 homes at high speed above 5 mc and at low speed below 5 mc.

c. Scanning: occurs after capacitor setting switches are set and when transmission is initiated by pressing of microphone button or key (in cw) to cause the following action: Brake O401 released, clutch O403 engaged, motor B401 drives roller along tuning coil L403 in search of resonance point. As resonance point is approached, brake O401 is applied momentarily and servo system takes over control of clutches O402 and O403. If resonance is passed, clutch O403 is released and clutch O402 engaged to return it to resonance where both clutches are disengaged, brake O401 applied, and motor B401 stopped.

d. Loading: occurs after resonance is established. Motor B403 drives loading capacitor C430 from maximum position until proper plate load is obtained, being reversed if necessary to obtain correct setting. During loading, tuning coil L403 is continuously adjusted to maintain resonance. When both resonance and proper loading are obtained, motors B401 and B403 are shut down.


8
C430
30 -760
MMF
CLUTCH
0-405
LOAD
MOTOR
B403
R419
47
C432
.01
N
S
R422
5, 12W
R425
8, 8W
R421
5, 12W
1
2
3
4
5
6
7

DETAIL "A" – OIL CAPACITOR

(SEE NOTE 3)

CONNEC
AMPLIFIER A
AM

NOTE 1:
ALL CAPACITOR VALUES IN MF UNLESS OTHERWISE SHOWN.

NOTE 2
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN

NOTE 3
SCHEMATIC SHOWN FOR UNITS CONTAINING VACUUM CAPACITOR ASSY
FOR UNITS CONTAINING OIL CAPACITOR ASSY 8838312-501 SEE DETAIL "A". WHERE DETAIL "A" IS USED IT REPLACES THAT PORTION OF SCHEMATIC BEGINNING AT POINTS INDICATED AS —○1 THRU —○8.

er, Radio Frequency AM-774A/ARC-21, Schematic Diagram

It lists tests that will assure field maintenance personnel that Amplifier, Radio Frequency AM-774A/ ARC-21 meets minimum standards of performance. The table may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

10-16. TUNING MECHANISM CHECK. Install the chassis in the unit and cycle the unit through a complete tuning sequence several times as a check on the functioning.

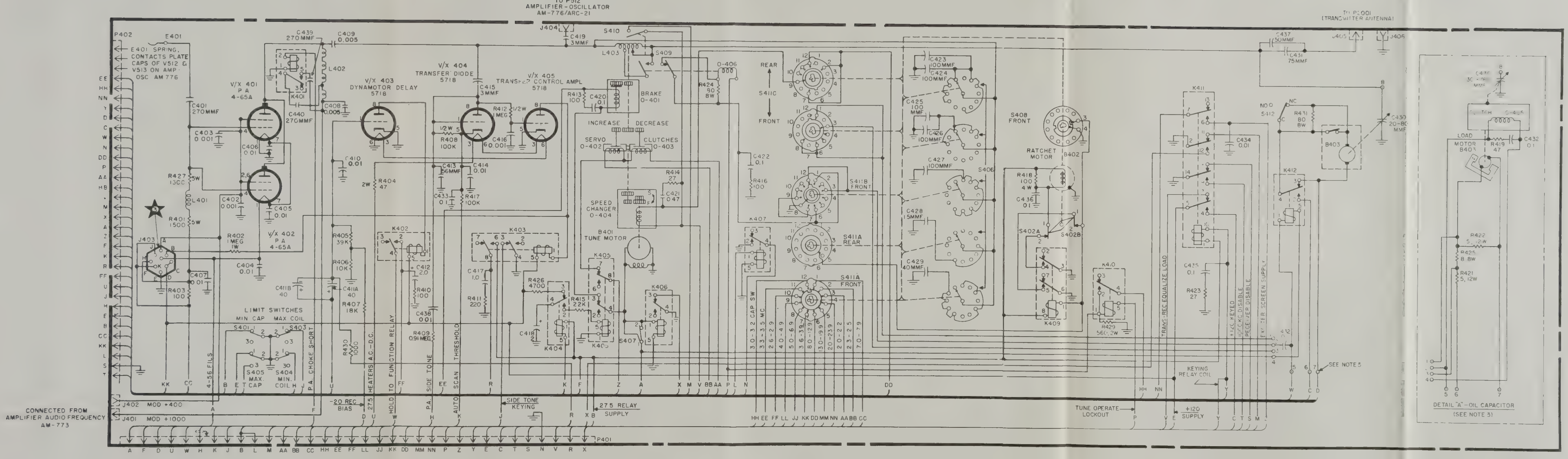
10-17. Set controls on Radio Set Control for "VOICE" operation, "POWER" at "HI", and "CONTROL" at "ON." Set up frequency control for 5.0 mc on one channel. Switch the equipment to this channel and observe the operation carefully for the following sequence:

a. Band Setting: occurs when equipment is switched on or the channel changed. Ratchet motor B402 drives capacitor setting and function switches S406 and S411 to proper position for frequency band if other than previous band setting.

b. Homing: occurs after band setting is completed. Brake O401 released, clutch O402 engaged. Motor B401 drives roller on plate tuning coil L403 to maximum inductance of home position at high speed. When L403 homes, clutch O402 is released, brake O401 applied, and motor B401 continues to run until C430 homes. Capacitor C430 homes simultaneously with coil L403 to maximum capacity. Capacitor C430 homes at high speed above 5 mc and at low speed below 5 mc.

c. Scanning: occurs after capacitor setting switches are set and when transmission is initiated by pressing of microphone button or key (in cw) to cause the following action: Brake O401 released, clutch O403 engaged, motor B401 drives roller along tuning coil L403 in search of resonance point. As resonance point is approached, brake O401 is applied momentarily and servo system takes over control of clutches O402 and O403. If resonance is passed, clutch O403 is released and clutch O402 engaged to return it to resonance where both clutches are disengaged, brake O401 applied, and motor B401 stopped.

d. Loading: occurs after resonance is established. Motor B403 drives loading capacitor C430 from maximum position until proper plate load is obtained, being reversed if necessary to obtain correct setting. During loading, tuning coil L403 is continuously adjusted to maintain resonance. When both resonance and proper loading are obtained, motors B401 and B403 are shut down.

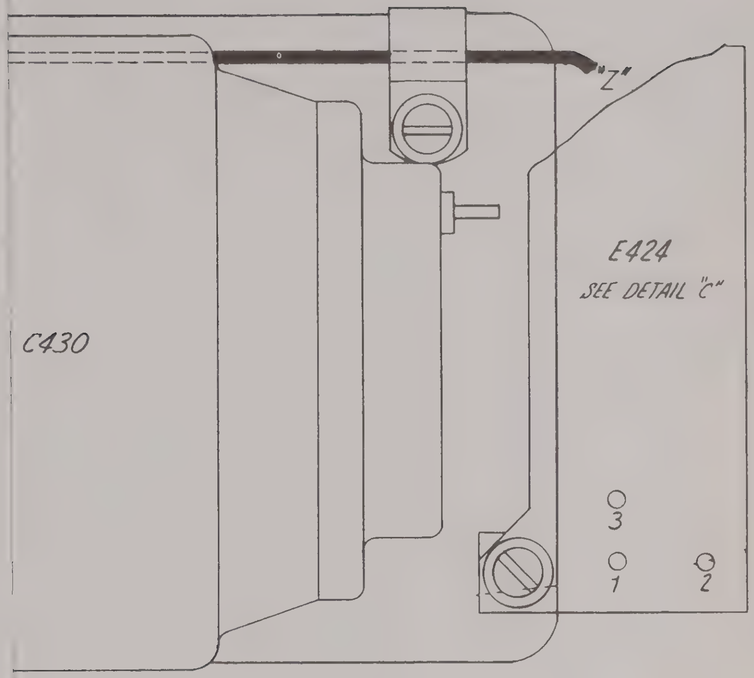

TO P512
AMPLIFIER-OSCILLATOR
AM-776/ARC-21
TO P2001
(TRANSMITTER ANTENNA)
P402
E401
E401 SPRING, CONTACTS PLATE CAPS OF V512 & V513 ON AMP OSC AM776
V/X 401 P A 4-65A
V/X 402 P A 4-65A
V/X 403 DYNAMOTOR DELAY 5718
V/X 404 TRANSFER DIODE 5718
V/X 405 TRANSFER CONTROL AMPL 5718
BRAKE O-401
INCREASE
DECREASE
SERVO O-402
CLUTCHES O-403
SPEED CHANGER O-404
B401 TUNE MOTOR
K401
K402
K403
K404
K405
K406
K407
K409
K410
K411
K412
S408 FRONT
RATCHET MOTOR
B402
S402A
S402B
S411C
REAR
FRONT
S411B FRONT
S411A REAR
S411A FRONT
LIMIT SWITCHES
MIN CAP
MAX COIL
S401
S403
S405 MAX CAP
S404 MIN COIL
4-5&FILS
CHOKE SHORT
P.A.
HEATERS A.C.-D.C.
TO FUNCTION RELAY
SIDE TONE
THRESHOLD
SCAN
TRANS-REC EQUALIZE LOAD
+120 KEYED
IDC/KEYED DISABLE
RECEIVER DISABLE
EXCITER SCREEN SUPPLY
KEYING RELAY COIL
SEE NOTE 5
LOAD MOTOR B403
DETAIL "A"-OIL CAPACITOR (SEE NOTE 3)
CONNECTED FROM AMPLIFIER AUDIO FREQUENCY AM-773
J402 MOD +400
J401 MOD +1000
-20 REC BIAS
27.5
HOLD
AUTO
SIDE TONE KEYING
27.5 RELAY SUPPLY
TUNE OPERATE LOCKOUT
+120 SUPPLY
P401

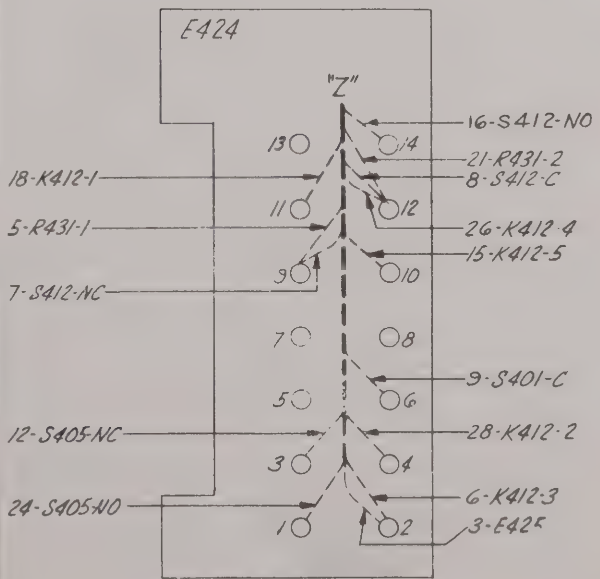
NOTE 1
ALL CAPACITOR VALUES IN MF UNLESS OTHERWISE SHOWN

NOTE 2
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN

NOTE 3
SCHEMATIC SHOWN FOR UNITS CONTAINING VACUUM CAPACITOR ASSY
FOR UNITS CONTAINING OIL CAPACITOR ASSY 186383 USE SEE DETAIL "A" WHERE DETAIL A IS USED IT REPLACES THAT PORTION OF SCHEMATIC BEGINNING AT POINT INDICATED A —O THRU —O8

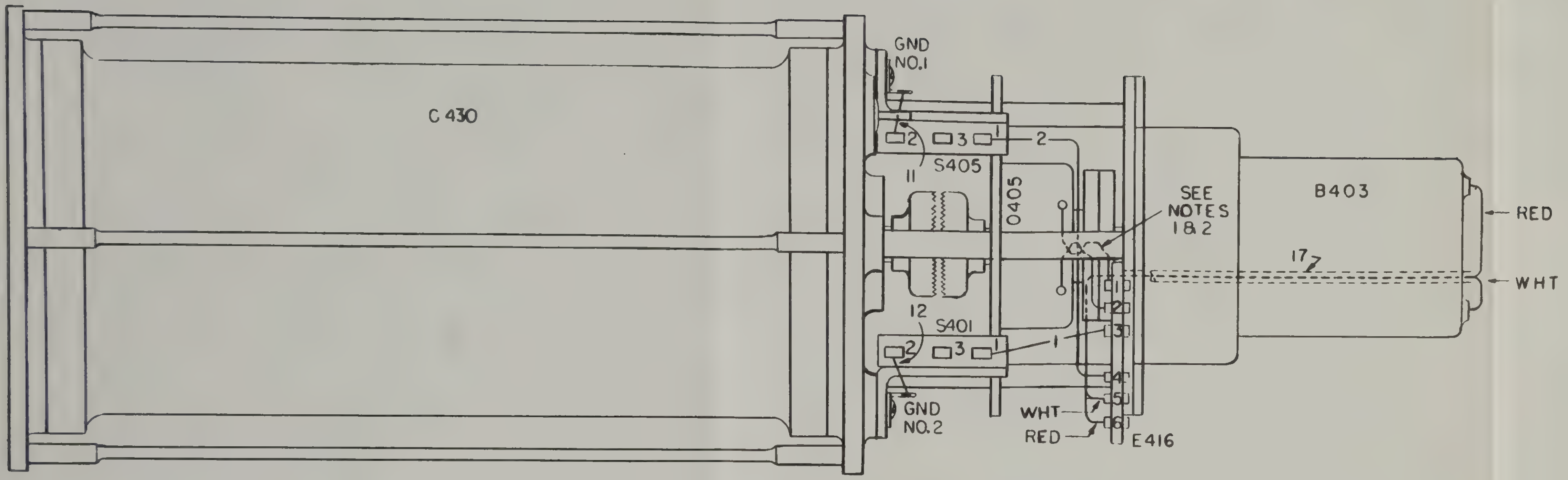
Figure 10-5. Amplifier, Radio Frequency AM-774A/ARC-21, Schematic Diagram


"Z"
E424
SEE DETAIL "C"
C430
3
1
2


E424
"Z"
16-S412-NO
13
14
21-R431-2
18-K412-1
8-S412-C
11
12
5-R431-1
26-K412-4
15-K412-5
9
10
7-S412-NC
7
8
9-S401-C
5
6
12-S405-NC
28-K412-2
3
4
24-S405-NO
6-K412-3
1
2
3-E425

DETAIL "C"

um Capacitor, Connection Diagram


GND NO.1
C 430
2
3
1
2
S405
11
0405
SEE NOTES 1 & 2
B403
RED
17
WHT
1
2
3
12
S401
2
3
1
1
4
5
6
GND NO.2
WHT
RED
E416

WIRE TABLE

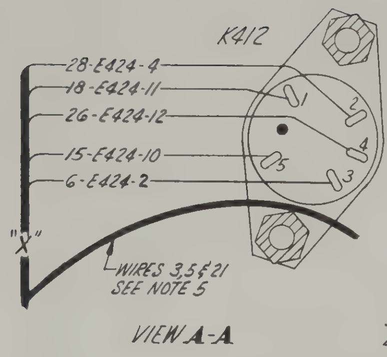
WIRE NO. (INCLUSIVE)	DESCRIPTION
	COLOR AND CONDUCTOR
1 - 2	WIRE WHT GRN TR AWG 24 600V
11-12	WIRE TIN. COP. .032 DIA.
17	TUBING INSUL. BLK

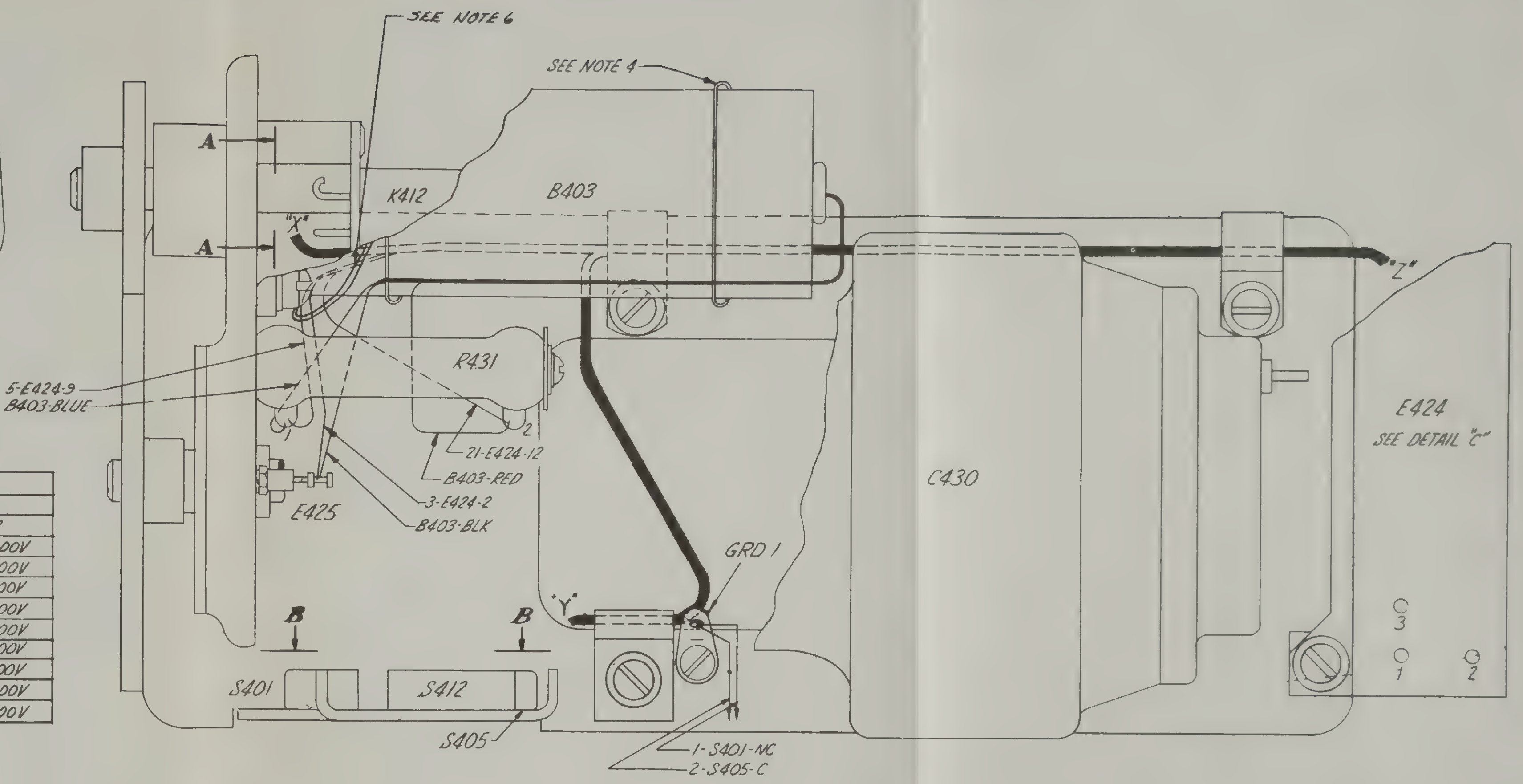
NOTE 1: WIRES FROM SOLENOID ARE TWISTED PAIR.

NOTE 2: DRESS AND SECURE LEADS USING LACING CORD,

NOTE 3: CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

Figure 10-6. Oil Capacitor, Connection Diagram

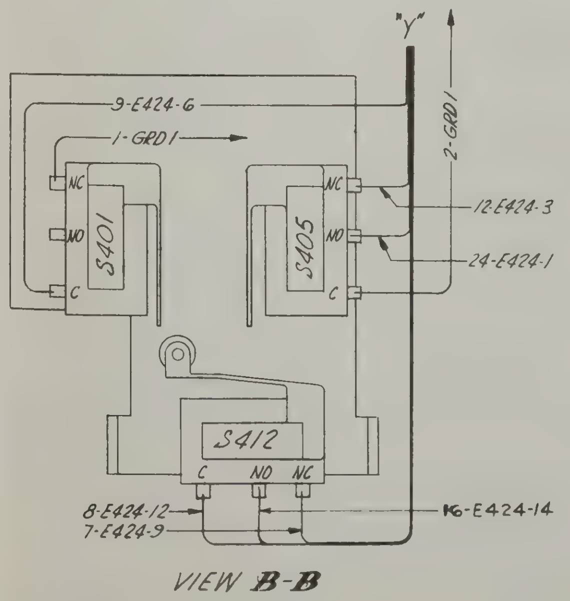

K412
28-E424-4
18-E424-11
26-E424-12
15-E424-10
6-E424-2
1
2
4
5
3
"X"
WIRES 3,5 & 21
SEE NOTE 5
VIEW A-A


SEE NOTE 6
SEE NOTE 4
A
A
K412
B403
"X"
"Z"
R431
5-E424-9
B403-BLUE
1
2
21-E424-12
B403-RED
3-E424-2
B403-BLK
E425
C430
E424
SEE DETAIL "C"
GRD 1
"Y"
B
B
S401
S412
S405
1-S401-NC
2-S405-C
3
1
2

WIRE TABLE		
WIRE NºS (INCLUSIVE)	DESCRIPTION	
	COLOR	CONDUCTOR
1 TO 3	WHT-BLK TCR	AWG #24 600V
5 TO 9	WHT-RED TCR	AWG #20 600V
12	WHT-YEL TCR	AWG #24 600V
15-16	WHT-GRN TCR	AWG #24 600V
18	WHT-BLU TCR	AWG #24 600V
21	WHT-ORN TCR	AWG #20 600V
24	WHT-BRN-BLU TCR	AWG #24 600V
26	WHT-BRN TCR	AWG #20 600V
28	WHT-RED-BLU TCR	AWG #20 600V

NOTES:

1. FORM & LACE CABLES AS SHOWN
2. SOLDER ALL ELECTRICAL CONNECTIONS
3. TERMINAL NUMBERS ARE FOR REFERENCE PURPOSES ONLY & MAY NOT APPEAR ON THE ACTUAL COMPONENT.
4. CABLE WIRES FROM B403 & TIE SECURELY TO B403 AS SHOWN
5. CABLE LEG CONTAINING WIRES 3,5 & 21 TO BE DRESSED AROUND POST SUPPORTING K412 AS SHOWN.
6. TIE WIRES FROM E424-2 & B403 BLK TO B403 HOUSING


"Y"
9-E424-6
1-GRD 1
2-GRD 1
NC
NO
C
S401
NC
NO
C
S405
12-E424-3
24-E424-1
S412
C
NO
NC
8-E424-12
7-E424-9
16-E424-14
VIEW B-B

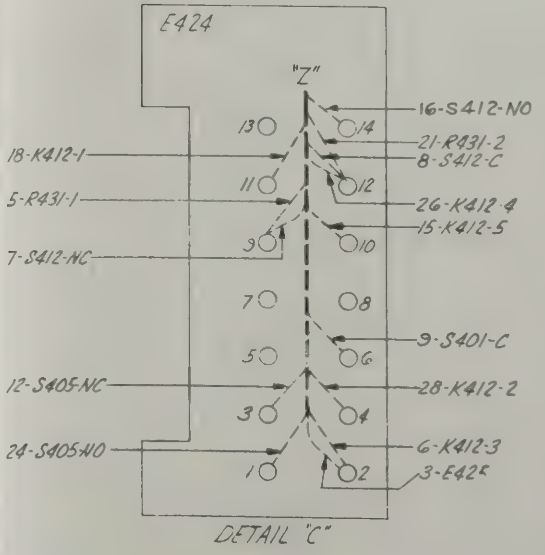
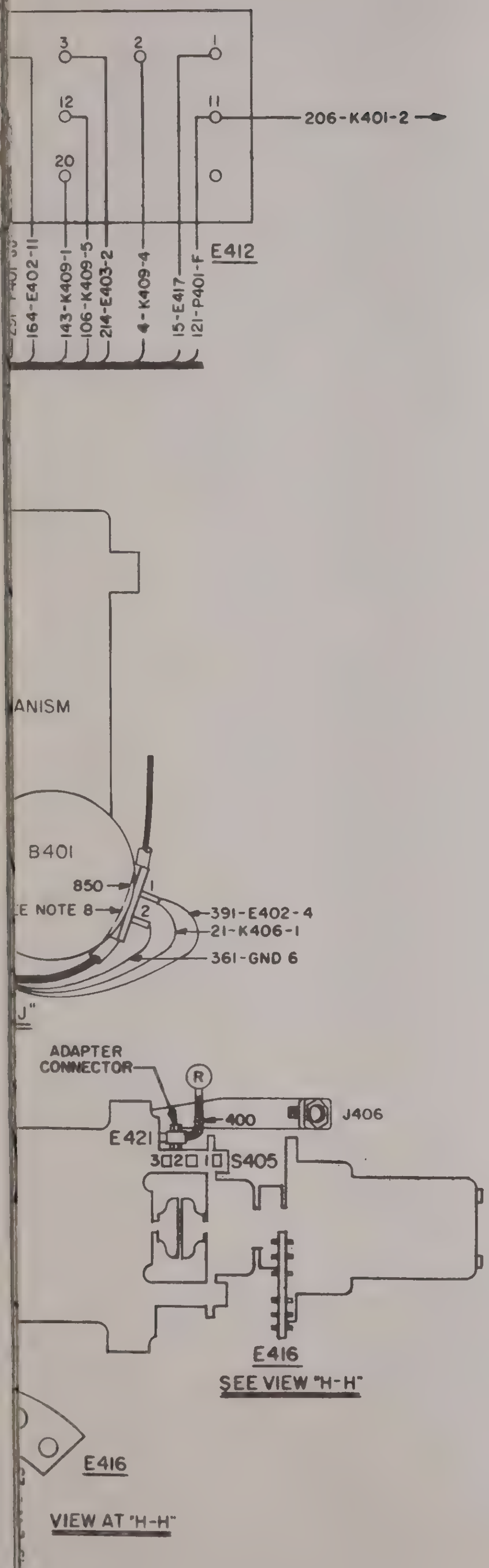
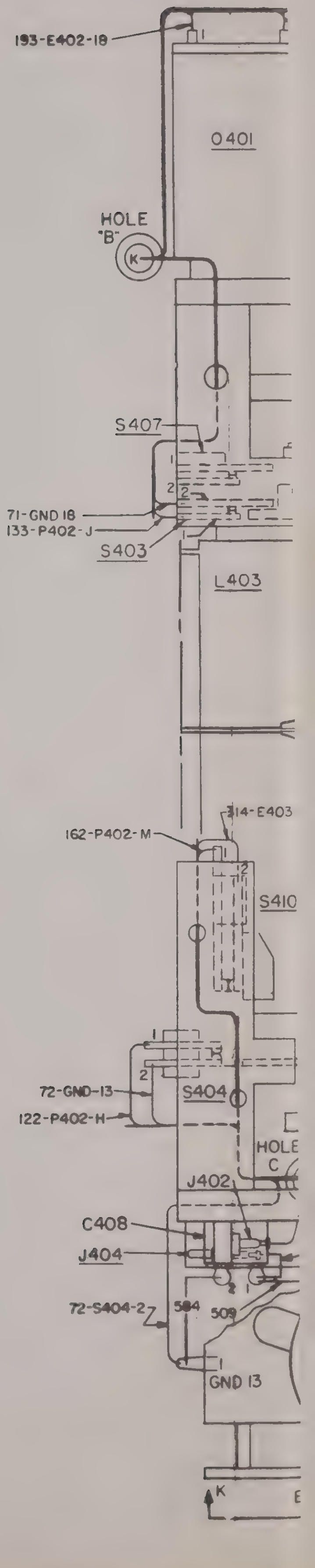
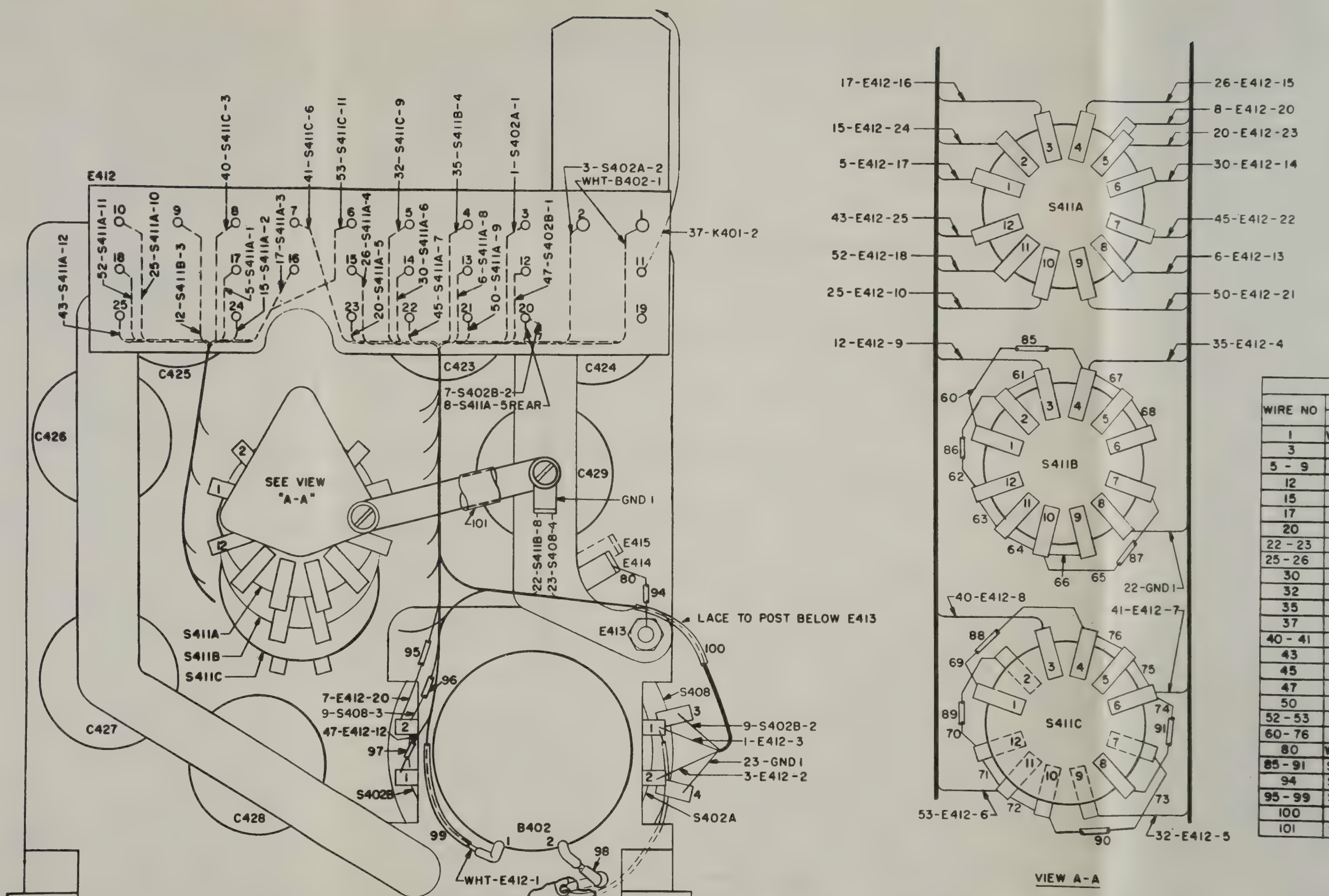

E424
"Z"
16-S412-NO
13
14
21-R431-2
8-S412-C
18-K412-1
11
12
5-R431-1
26-K412-4
15-K412-5
9
10
7-S412-NC
7
8
9-S401-C
5
6
12-S405-NC
28-K412-2
3
4
24-S405-NO
6-K412-3
1
2
3-E425
DETAIL "C"

Figure 10-6A. Vacuum Capacitor, Connection Diagram

X


3
2
1
12
11
20
206-K401-2
164-E402-11
143-K409-1
106-K409-5
214-E403-2
4-K409-4
15-E417
121-P401-F
E412
ANISM
B401
850
E NOTE 8
1
2
391-E402-4
21-K406-1
361-GND 6
J"
ADAPTER
CONNECTOR
R
400
J406
E421
3 2 1 S405
E416
SEE VIEW "H-H"
E416
VIEW AT "H-H"


193-E402-18
1
Q401
HOLE
"B"
K
S407
1
2
71-GND 18
133-P402-J
S403
L403
314-E403
162-P402-M
2
S410
1
72-GND-13
2
122-P402-H
S404
HOLE
C
J402
C408
J404
72-S404-2
584
509
1
GND 13
K
E


E412
43-S411A-12
52-S411A-11
25-S411A-10
12-S411B-3
40-S411C-3
5-S411A-1
15-S411A-2
17-S411A-3
41-S411C-6
53-S411C-11
26-S411A-4
20-S411A-5
32-S411C-9
30-S411A-6
45-S411A-7
35-S411B-4
6-S411A-8
50-S411A-9
1-S402A-1
47-S402B-1
3-S402A-2
WHT-B402-1
37-K401-2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
C425
C423
C424
C426
C429
7-S402B-2
8-S411A-5REAR
SEE VIEW "A-A"
GND 1
101
22-S411B-8
23-S408-4
E415
E414
80
94
E413
LACE TO POST BELOW E413
100
S411A
S411B
S411C
95
96
7-E412-20
9-S408-3
47-E412-12
97
S402B
S408
9-S402B-2
1-E412-3
23-GND 1
3-E412-2
S402A
C427
C428
B402
99
98
WHT-E412-1
17-E412-16
15-E412-24
5-E412-17
43-E412-25
52-E412-18
25-E412-10
12-E412-9
26-E412-15
8-E412-20
20-E412-23
30-E412-14
45-E412-22
6-E412-13
50-E412-21
35-E412-4
85
86
87
88
89
90
91
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
22-GND 1
40-E412-8
41-E412-7
53-E412-6
32-E412-5

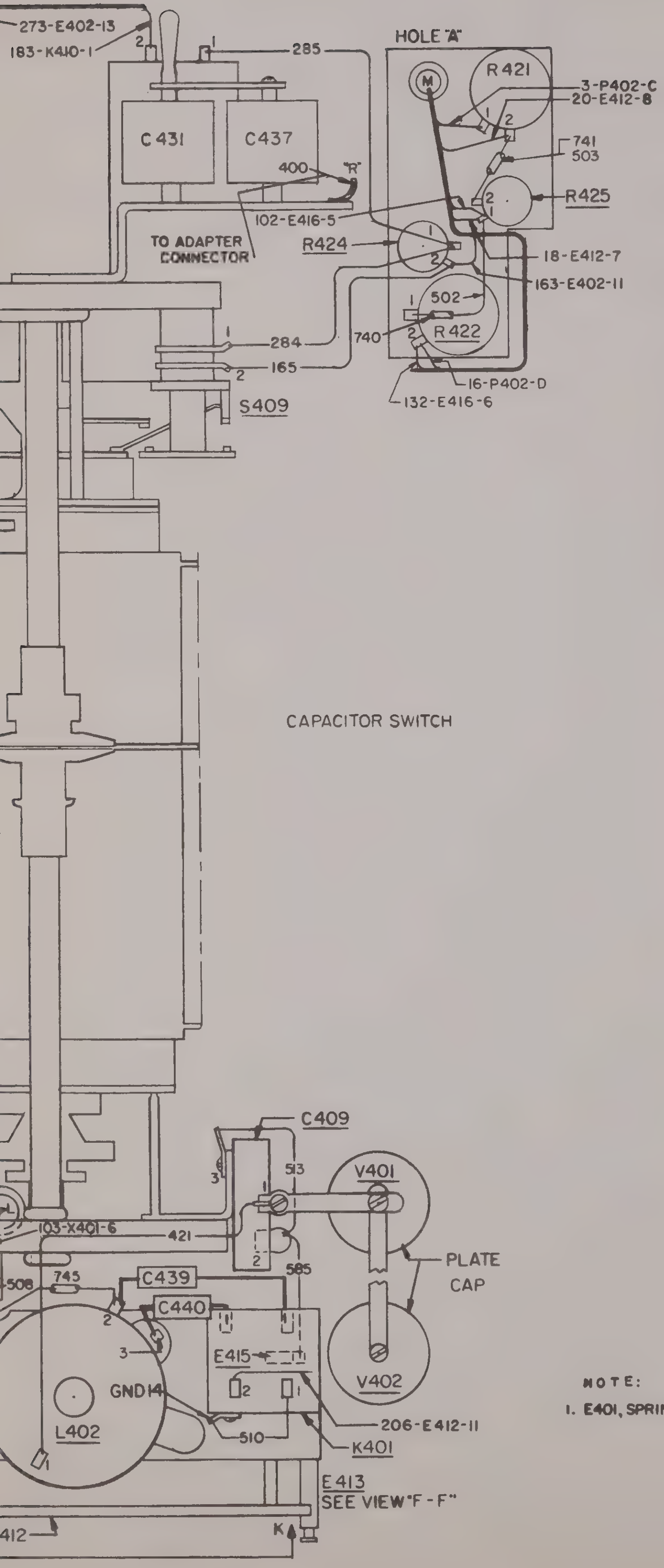
VIEW A-A

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1	WIRE, WHT/RED TR AWG 20 600V
3	RED/BLU TR AWG 20 600V
5 - 9	RED TR AWG 24
12	GRN
15	BLU
17	ORN
20	BRN
22 - 23	BLK TR
25 - 26	RED/BLU TR
30	RED/GRN TR
32	YEL/RED/BLK TR
35	BRN/RED/BLK TR
37	RED/BLK TR
40 - 41	BLK/BRN
43	YEL/RED
45	YEL/BLK
47	YEL/GRN
50	GRN/BRN TR
52 - 53	WHT AWG 24 600V
60 - 76	TINNED COPPER .020 DIA
80	WIRE, TINNED COPPER .040 DIA
85 - 91	SLEEVING BLK .022 ID
94	SLEEVING .042 ID
95 - 99	SLEEVING .053 ID
100	SLEEVING .133 ID
101	SLEEVING BLK 166 ID

NOTES:

1. FORM AND LACE CABLE USING LACING CORD
2. SLEEVING AS SHOWN TO BE USED WHERE WIRING TOUCHES A METAL SURFACE.
3. CRIMP AND SOLDER ALL ELECTRICAL CONNECTIONS USING SOLDER

Figure 10-7. Capacitor Switch, Connection Diagram


273-E402-13
183-K410-1
2
1
285
HOLE "A"
M
R421
1
2
3-P402-C
20-E412-8
741
503
C431
C437
400
"R"
2
1
R425
102-E416-5
TO ADAPTER CONNECTOR
R424
1
2
18-E412-7
163-E402-11
502
1
R422
2
740
284
1
165
2
16-P402-D
132-E416-6
S409
CAPACITOR SWITCH
C409
3
513
V401
103-X401-6
421
2
585
PLATE CAP
508
745
C439
2
C440
3
E415
2
1
GND14
V402
L402
1
206-E412-11
510
K401
E413
SEE VIEW "F-F"
412
K

WIRE TABLE			
WIRE NO. INCULSIVE	DESCRIPTION COLOR AND CONDUCTOR		
1-4	WIRE WHT-RED/BLU TR.	AWG 20	600V
11-21	RED TR.	AWG 20	
71-73	BLK	AWG 24	
81-82	BRN		
91-94	RED		
101-106	ORN		
111-117	YEL		
121-123	GRN		
131-134	BLU TR		
141-143	BLK/BRN TR		
151-154	BLK/RED		
161-165	BLK/GRN		
171-172	BRN/RED		
181-184	BRN/GRN		
191-194	BRN/BLU		
201-206	RED/BLK		
211-214	RED/GRN		
221-224	RED/BLU		
231-233	YEL/BLK		
241-243	YEL/GRN		
251-253	YEL/RED		
261-266	GRN/BLK		
271-273	GRN/BRN		
281-285	GRN/RED		
291-294	BLU/BRN		
301-302	WHT-BLU/BLK TR.		
311-314	RED		
321-323	GREEN		
331-333	YELLOW		
341-344	BLUE	AWG 24	
361	WHT-BLU TR.	AWG 18	
371-372	WHT-BRN TR.	AWG 18	
391-392	WIRE WHT-GRN TR.	AWG 18	600V
400	CABLE, BRAIDED COPPER		
421	WIRE WHT-ORN	AWG 20	600V
441	CABLE SHIELDED WHT	AWG 24	600V
452-475	WIRE TINNED COPPER	.0159 DIA.	
501-542	WIRE TINNED COPPER	.0320 DIA.	
581-585	WIRE TINNED COPPER	.0402 DIA	
702-713	SLEEVING INSUL BLK	.022 ID	
820	SLEEVING INSUL BLK	.085 ID	
830	SLEEVING INSUL BLK	.133 ID	
731-750	SLEEVING INSUL BLK	.042 ID	
850	SLEEVING INSUL BLK	.294 ID	
812	SLEEVING INSUL BLK	.076 ID	

NOTE:

1. E401, SPRING, CONTACTS PLATE CAPS OF V512 & V513 ON PERM. TUNER CHASSIS.

TABLE XLVIII. CIRCUITS CONTROLLED BY SWITCHES IN AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21

SWITCH		
S411A	Front Rear	Homing wafer (remote frequency information)
S411B	Front	Shorting switch on inductor L403 and clutch O405 operation
S411C	Front	Speed control on motor B403
	Rear	Speed control on speed changer O404
S406		Selects input tuning capacitor
S408		Homing wafer

TABLE XLIX. MAINTENANCE CHECK LIST FOR AMPLIFIER, RADIO FREQUENCY AM-774A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
1. Chassis, electronic components	dents, cracks, bent pins, stripped threads, discoloration, leakage, corrosion, burned or deteriorated insulation
2. Mechanical components	breakage, chipping, scoring, misalignment, sticking

II. LUBRICATION

Figure	Name	Lubricant	Period	Application
10-4	O406 Plunger	Oil MIL-O-6085	500 hours and on assembly	One drop from oil can to bearing surface
	Studs (attaching part for O406 bushing)	Oil MIL-O-6085	500 hours and on assembly	One drop from oil can to bearing each stud

III. PERFORMANCE IN OUT

Test Step	Reference Paragraph	Input	Test Equipment	Test Point	Signal Out	Remarks
Tuning Mechanism Check	10-16	-	-	-	-	Visual check of operation
Transmitter Output "HI"	-	Grid drive on V401, V402	DA-72/U	J2001	100W	"POWER" switch on "HI"
Transmitter Output "LOW"	-	Grid drive on V401, V402	DA-72/U	J2001	10W	"POWER" switch on "LOW"

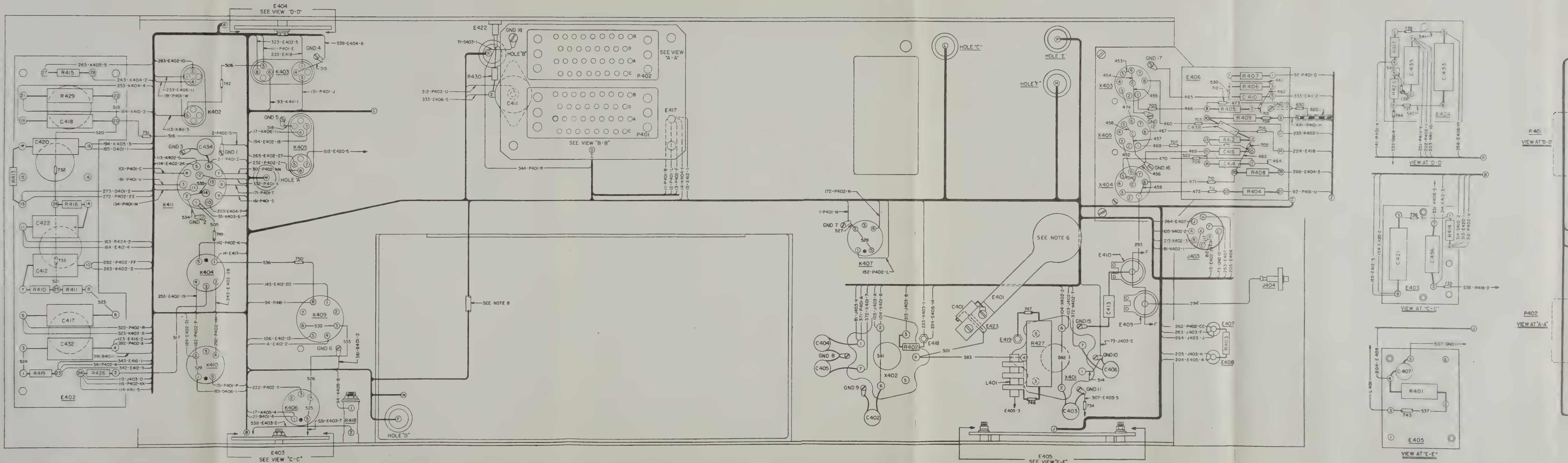
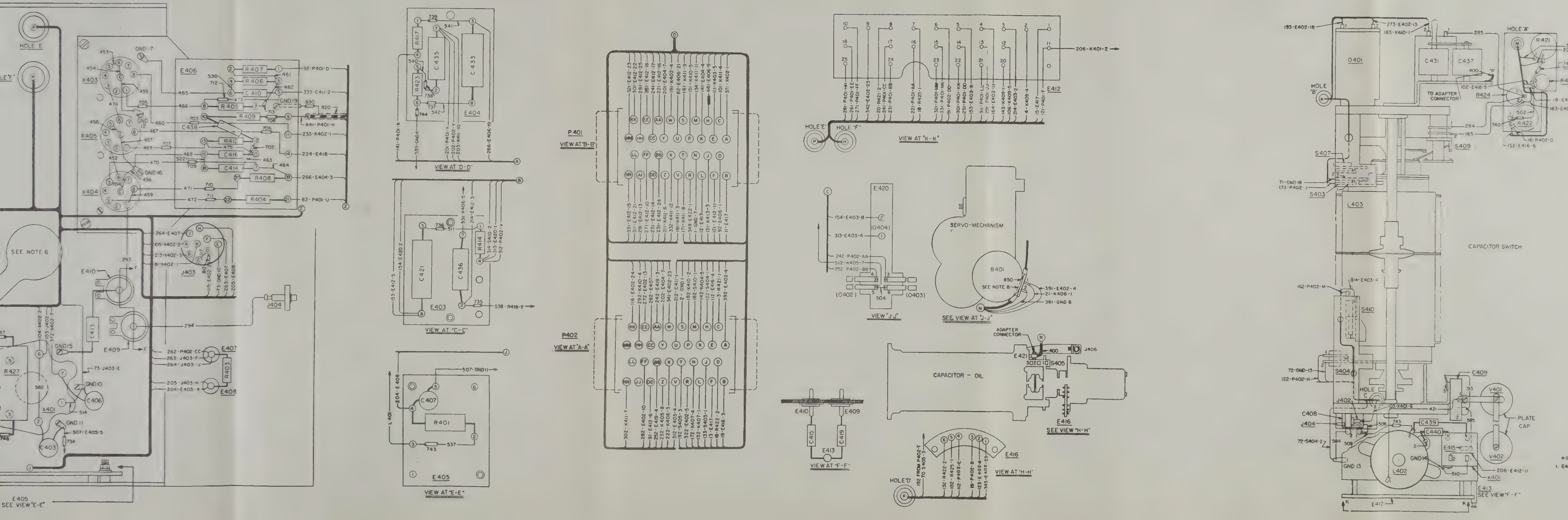

E404
SEE VIEW "D-D"
E422
GND 18
HOLE "B"
SEE VIEW "A-A"
P402
P401
SEE VIEW "B-B"
E417
C411
R430
K403
K402
K405
K411
K404
K409
K410
K406
K407
HOLE "A"
HOLE "C"
HOLE "D"
HOLE "E"
HOLE "F"
R415
R429
C418
C420
R413
R416
C422
C412
R410
R411
C417
C432
R419
R426
E402
C434
R418
E403
SEE VIEW "C-C"
SEE NOTE 8
SEE NOTE 6
X403
X405
X404
X402
X401
E406
R407
R406
C410
R405
R409
C438
R412
C416
C414
R408
R404
J403
J404
E401
E410
E409
C413
C401
E423
R402
E418
E419
R427
L401
C404
C405
C402
C403
C406
E407
E408
R403
E405
SEE VIEW "E-E"
R417
R421
C435
C433
VIEW AT "D-D"
C421
C436
R414
VIEW AT "C-C"
C407
R401
VIEW AT "E-E"
P401
VIEW AT "B-B"
P402
VIEW AT "A-A"

Figure 10-8. Amplifier, Radio Frequency AM-774A/ARC-21, Connection Diagram


HOLE E
SEE NOTE 6
E406
R407
R406
C410
R405
R409
C438
R415
C416
C414
R408
R404
X403
X405
X404
J403
E410
E409
C413
J404
E407
R403
E408
R427
X401
C406
C403
E405
SEE VIEW "E-E"
VIEW AT "D-D"
R417
C435
C433
R423
E404
VIEW AT "C-C"
C421
C436
R414
E403
VIEW AT "E-E"
C407
R401
E405
L401
P401
VIEW AT "B-B"
P402
VIEW AT "A-A"
HOLE "E"
HOLE "F"
VIEW AT "K-K"
E412
206-K401-2
E420
(0404)
(0402)
(0403)
504
VIEW "J-J"
SERVO-MECHANISM
B401
SEE NOTE 8
SEE VIEW AT "J-J"
ADAPTER CONNECTOR
E421
J406
S405
CAPACITOR - OIL
E416
SEE VIEW "H-H"
E410
E409
C415
C419
E413
VIEW AT "F-F"
HOLE "D"
E416
VIEW AT "H-H"
HOLE "A"
R421
R425
HOLE "B"
0401
C431
C437
TO ADAPTER CONNECTOR
R424
R422
S409
S407
S403
L403
CAPACITOR SWITCH
S410
S404
HOLE C
J402
C408
J404
C409
V401
PLATE CAP
V402
C439
C440
E415
GND 13
L402
GND 14
K401
E413
SEE VIEW "F-F"
E412

WIRE NO. INCLUSIVE	DESCRIPTION COLOR AND CONDUCTOR		
1-4	WIRE WHT-RED/BLU TR.	AWG 20	600V
11-21	RED TR	AWG 20	
71-73	BLK	AWG 24	
81-82	BRN		
91-94	RED		
101-106	ORN		
111-117	YEL		
121-123	GRN		
131-134	BLU TR		
141-143	BLK/BRN TR		
151-154	BLK RED		
161-165	BLK/GRN		
171-172	BRN/RED		
181-184	BRN GRN		
191-194	BRN/BLU		
201-206	RED/BLK		
211-214	RED/GRN		
221-224	RED/BLU		
231-233	YEL/BLK		
241-243	YEL GRN		
251-253	YEL RED		
261-266	GRN/BLK		
271-273	GRN/BRN		
281-285	GRN/RED		
291-294	BLU/BRN		
301-302	WHT-BLU/BLK TR		
311-314	RED		
321-323	GREEN		
331-333	YELLOW		
341-344	BLUE	AWG 24	
361	WHT-BLU TR.	AWG 18	
371-372	WHT-BRN TR.	AWG 18	
391-392	WIRE WHT-GRN TR.	AWG 18	600V
400	CABLE, BRAIDED COPPER		
421	WIRE WHT-ORN	AWG 20	600V
441	CABLE SHIELDED WHT	AWG 24	600V
452-475	WIRE TINNED COPPER	.0159 DIA.	
501-542	WIRE TINNED COPPER	.0320 DIA.	
581-585	WIRE TINNED COPPER	.0402 DIA.	
702-713	SLEEVING INSUL BLK	.022 ID	
820	SLEEVING INSUL BLK	.085 ID	
830	SLEEVING INSUL BLK	.133 ID	
731-750	SLEEVING INSUL BLK	.042 ID	
850	SLEEVING INSUL BLK	.294 ID	
812	SLEEVING INSUL BLK	.076 ID	

NOTE:

1. E401, SPRING, CONTACTS PLATE CAPS OF V512 & V513 ON PERM. TUNER CHASSIS.

SECTION XI

MAINTENANCE INSTRUCTIONS FOR AMPLIFIER-OSCILLATOR AM-776A/ARC-21

11-1. GENERAL.

11-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

11-3. This unit comprises nine separately shielded r-f coil boxes arranged for ganged permeability tuning, each using a separate core for each of the four frequency bands. Each plug-in coil box also includes the ganged band-switch, trimmer capacitors, and associated electron tubes and resistors.

11-4. The following frequency relationships in the Amplifier-Oscillator AM-776A/ARC-21 circuits should be borne in mind to prevent confusion.

11-5. The master oscillator V506 output frequency is equal to (F/2) + 900 kc, where F is the channel frequency. This frequency is doubled to F + 1800 kc by V504 for the injection frequency in the first mixer of the receiver. Upon mixing with the channel frequency F in kilocycles, the difference of 1800 kc is utilized in the i-f stages.

11-6. The oscillator output (F/2) + 900 kc is also fed through a buffer V507 to balanced modulators, V508 and V509, which for cw and voice, are also fed 900 kc from the fixed divider. Functioning as a mixer, the output of the balanced modulator is a difference frequency of F/2 which is amplified in V510 and V511 and doubled in V512 and V513 to provide F, or channel frequency, to drive the power amplifier tubes.

11-7. From the above it follows that the range of output frequencies of the various stages in the amplifier-oscillator circuits for the four bands will be as given in Table L.

11-8. Five of the coil boxes function as the receiver antenna amplifier, r-f amplifier, first mixer, injection voltage doubler and oscillator respectively. The remaining boxes contain exciter stages for the transmitter.

11-9. TROUBLE ANALYSIS.

11-10. **PRELIMINARY.** The first step in servicing a defective Amplifier-Oscillator AM-776A/ARC-21 is to examine it carefully for visible signs of distress or damage. Check any circuit components that show signs of overheating for designated values by reference to the schematic diagram, figure 11-13. Also make the resistance measurements indicated in Tables LI and LII. See figure 11-1 for tube location.

TABLE L. OPERATING FREQUENCIES IN MEGACYCLES

	Band											
	1			2			3			4		
	Low Freq	Core Set Freq	High Freq	Low Freq	Core Set Freq	High Freq	Low Freq	Core Set Freq	High Freq	Low Freq	Core Set Freq	High Freq
Nominal Platform Dial Reading	85	408	545	85	307	545	85	325	545	85	318	545
V501 Antenna Amp.	2	3.6	5	5	6.6	9	9	12.2	16	16	19.6	24
V502 R-F Amp.	2	3.6	5	5	6.6	9	9	12.2	16	16	19.6	24
V503 Mixer	2	3.6	5	5	6.6	9	9	12.2	16	16	19.6	24
V504 Doubler	3.8	5.4	6.8	6.8	8.4	10.8	10.8	14	17.8	17.8	21.4	25.8
V505 Reactance	1.9	2.7	3.4	3.4	4.2	5.4	5.4	7	8.9	8.9	10.7	12.9
V506 Oscillator	1.9	2.7	3.4	3.4	4.2	5.4	5.4	7	8.9	8.9	10.7	12.9
V507 Buffer	1.9	2.7	3.4	3.4	4.2	5.4	5.4	7	8.9	8.9	10.7	12.9
V508 Bal. Mod.	1	1.8	2.5	2.5	3.3	4.5	4.5	6.1	8	8	9.8	12
V509 Bal. Mod.	1	1.8	2.5	2.5	3.3	4.5	4.5	6.1	8	8	9.8	12
V510 1st Amp.	1	1.8	2.5	2.5	3.3	4.5	4.5	6.1	8	8	9.8	12
V511 2nd Amp.	1	1.8	2.5	2.5	3.3	4.5	4.5	6.1	8	8	9.8	12
V512 Doubler	2	3.6	5	5	6.6	9	9	12.2	16	16	19.6	24
V513 Doubler	2	3.6	5	5	6.6	9	9	12.2	16	16	19.6	24

Note: Tolerance on core set ± 1 division. Tolerance on ends of bands ± 10 divisions.

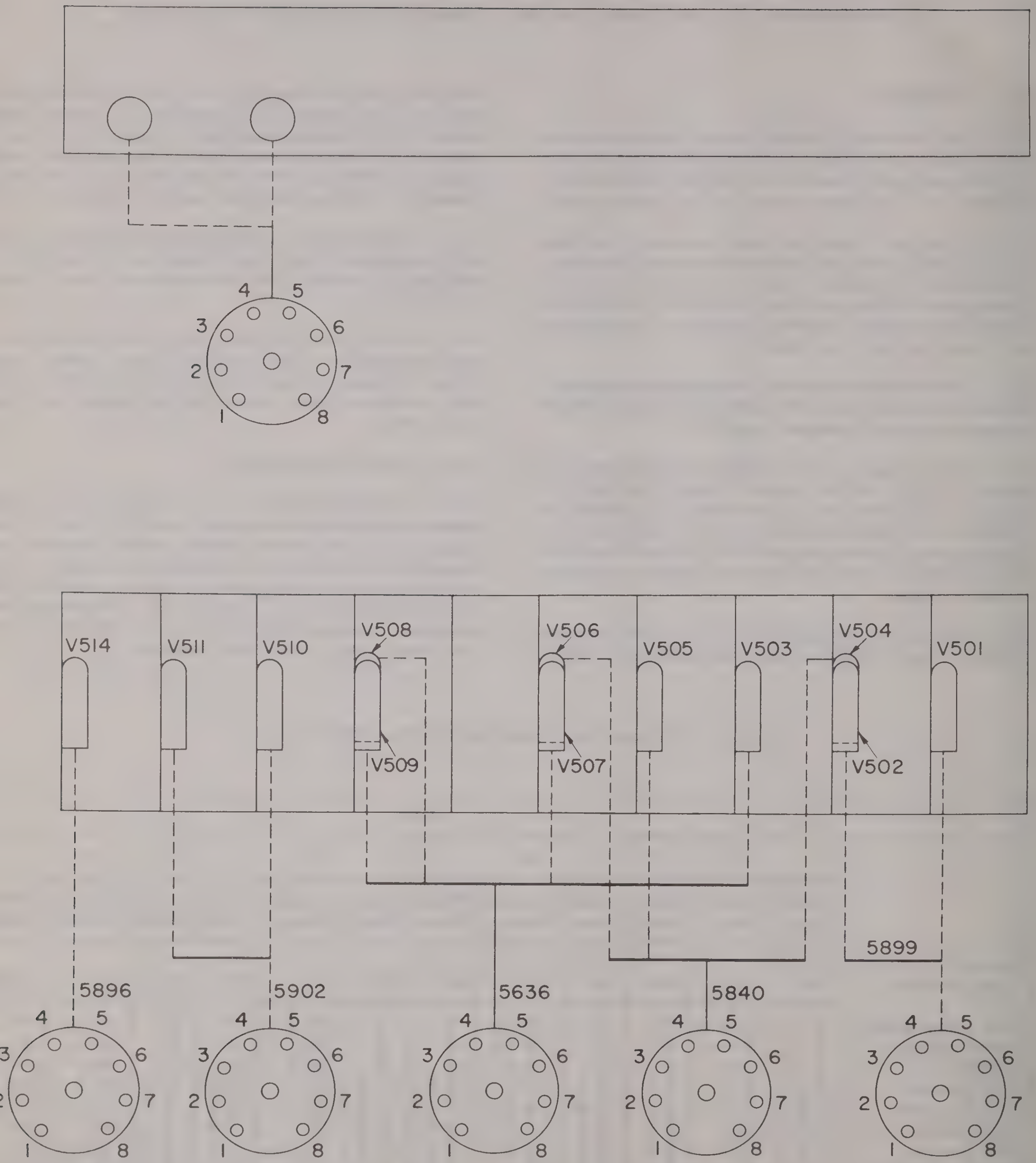

4
5
3
6
2
7
1
8
V514
V511
V510
V508
V506
V505
V503
V504
V501
V509
V507
V502
5899
5896
5902
5636
5840
4
5
3
6
2
7
1
8

Figure 11-1. Amplifier-Oscillator AM-776A/ARC-21, Tube Location

TABLE LI. RESISTANCE IN OHMS, FROM PLUG, P501, PINS TO GROUND AMPLIFIER-OSCILLATOR AM-776A/ARC-21

Pin	A	B	C	D	E	F	H	J	K	L
Reading	*	*	*	*	0	*	*	*	0	20
Pin	M	N	R	S	T	U	V	W	X	Y
Reading	*	5500	5000	*	10.5k	10.5k	10.5k	6	5000	5000
Pin	Z	AA	BB	CC	DD	EE	FF	HH	JJ	KK
Reading	*	38	*	*	-	*	*	*	*	11.5
Pin	LL	MM	NN							
Reading	3.3	*	-							

* Infinite resistance value.

TABLE LII. RESISTANCE CHART, AMPLIFIER-OSCILLATOR AM-776A/ARC-21

All resistances in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Conditions: Chassis removed from unit. No cables connected.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V501	-5899	**	-	0	-	**	6.2	**	150
V502	-5899	**	-	6.2	-	**	11.0	**	150
V503	-5636	470k	-	15.0	820k	**	11.3	**	180
V504	-5840	1 meg	0	15.0	-	**	8.0	**	-
V505	-5840	**	-	8.0	-	**	0	**	3900
V506	-5840	10k	0	15.0	-	**	22.0	**	-
V507	-5636	220k	-	22.0	-	**	29.0	**	1650
V508	-5636	**	-	8.5	47k	**	6	**	150
V509	-5636	**	-	6	47k	**	0	**	150
V510	-5902	**	560	8.5	**	**	10	**	**
V511	-5902	**	**	10	**	**	11.5	**	560
V512*	-2E26	**	**	**	**	27k	235	**	**
V513*	-2E26	**	0	**	**	27k	235	**	**
V514	-5896	**	**	0	0	**	3	**	**

* Tubes removed from sockets. ** Infinite resistance value.

11-11. Place the unit on a support with the wide flange side down. Remove damping spring (if present) from end of tuning support (rack). Rotate the shaft, with the slotted end protruding at the dial end of the assembly, clockwise to the "MANUAL" position. This raises the quadrant attached to the reduction gear housing permitting manual operation of the core tuning mechanism.

CAUTION

Do not drive the plate forcibly against the end stops as this may upset accuracy of gear backlash adjustment. Replace damping spring on end of tuning support rack after completing tests or checks in "MANUAL" position.

11-12. Check the freedom of motion of the permeability tuning mechanism by pushing the end of the rack attached to the center of the plate carrying the adjustable cores.

11-13. Lubricate if necessary as described in Table LXII. Rotate slotted shaft counterclockwise to return mechanism to automatic tuning position.

11-14. BENCH TESTS. Connect the unit into the bench test setup by means of test cables, making certain all coaxial cable inputs to the unit are complete.

11-15. TUNING FUNCTION. Check the operation of the tuning mechanism in the following manner:

a. Set control on Radio Set Control C-451A/ARC-21

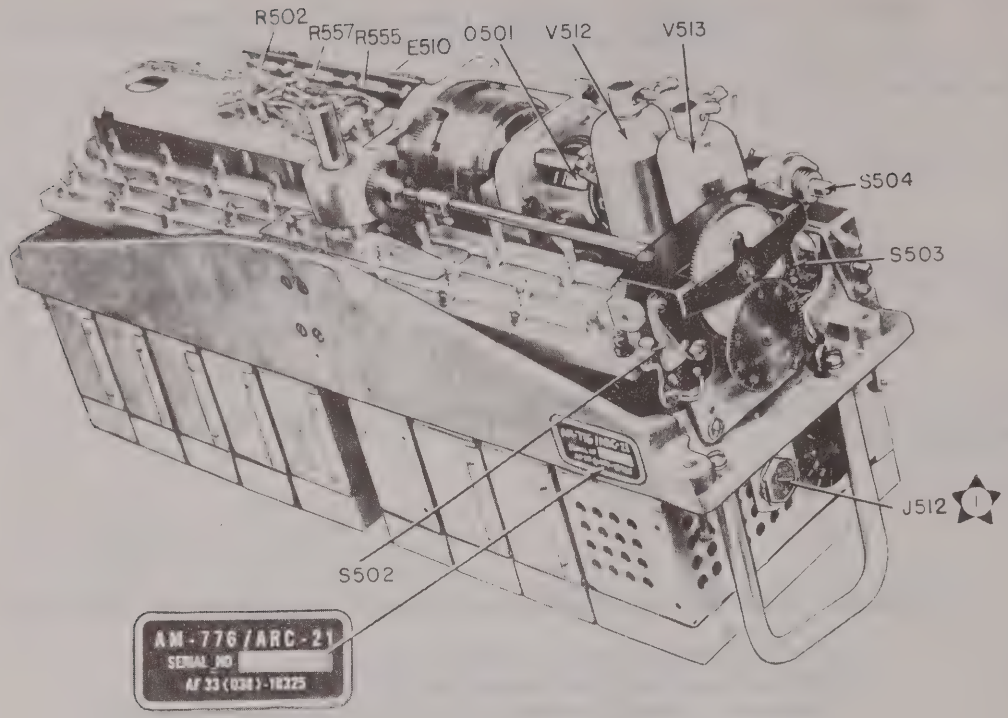


Figure 11-2. Amplifier-Oscillator AM-776A/ARC-21, Tuning Side

for "VOICE" operation and "POWER" switch to "LOW."

b. Move "CONTROL" switch to "ON" and allow equipment to warm up.

c. Observe the unit carefully, during the equipment warm-up period. For a normal tuning cycle the tuner "homes" when first turned on and then after a 30-second warm-up delay the tuning cycle will be initiated since operating temperature has been reached. Observe the three indicator dials to check operations. One dial, the small one, indicates the band in use having two series of numbers of 1 to 4. The other two dials are the fine and coarse tuning dials indicating the relative position of the tuning slugs. These dials are at the rear end of the unit and should rotate rapidly first to the homing or low-frequency position, hold until the band switches and servo selector are set as indicated by band-switch dials, and then rotate rapidly as the frequency band is scanned until operating frequency is reached. The dials stop and then reverse very slowly to correct the overshoot, coming to a stop at the correct tuning position.

d. Rotate "CHANNEL" selector switch to a channel in a different band and observe again the homing band setting, scanning, and final tuning cycle. If correct action is obtained on several channels, it indicates the tuning mechanism is not defective.

11-16. MECHANICAL TUNING TROUBLE. Assuming that the amplifier-oscillator unit is being tested with a Radio Receiver-Transmitter RT-128A/ARC-21 that is in operative condition, failure of the unit to tune properly is due to one of the following causes:

a. Defective motors. Refer to schematic diagram, figure 11-21 for data. A defective motor can be found by checking the voltage at its terminals. If voltage is present and motor does not turn, replace the motor. If the tuning motor turns and produces a clicking sound a mechanical overload is indicated. Turn the equipment off.

b. Defective or improperly adjusted limit switches. Refer to schematic diagram, figure 11-21. The proper dial settings for operation of the limit switches are shown in table LVI.

c. Defective relays. After checking limit switches and tuning motor and clicking continues, defective relays K501 and K504 or their associated wiring are indicated.

d. Defective band switching motor B502 or the associated relay, K502, and switch section, S501A, with their associated wiring; check these items.

e. Defective tuning circuits that fail to provide excitation of proper frequency or amplitude. These must be checked as described in table L.

11-17. DETAILED TROUBLE ANALYSIS. When it is necessary to make a detailed check of the unit it is preferable to check the oscillator circuits first, since a defect in this circuit may render both transmitter and receiver circuits inoperative. Apply the procedure given in table LIII. This gives a rough check of significant voltages and currents.

11-18. The possible causes listed will serve as a guide as to whether alignment or adjustment is necessary which can be performed without dismantling the unit. Refer to 11-27 and 11-31 for transmitter exciter and r-f tuner alignment procedures, respectively. If it is necessary to remove a box from the assembly, refer to paragraph 11-22 for instructions.

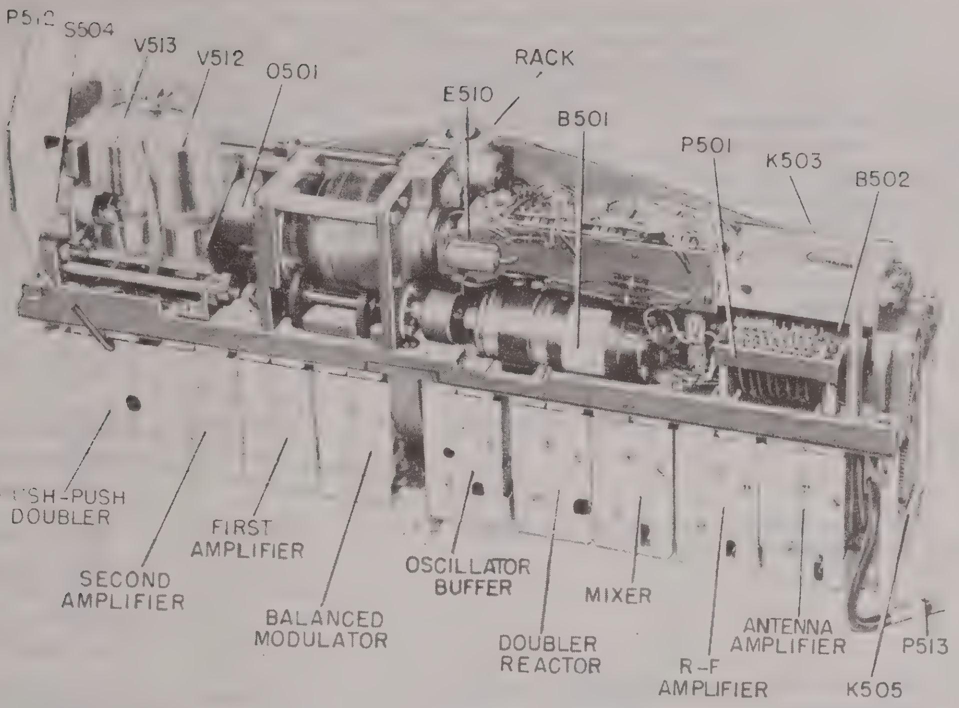

P512
S504
V513
V512
O501
RACK
E510
B501
P501
K503
B502
PUSH-PUSH DOUBLER
FIRST AMPLIFIER
SECOND AMPLIFIER
BALANCED MODULATOR
OSCILLATOR BUFFER
MIXER
DOUBLER REACTOR
ANTENNA AMPLIFIER
R-F AMPLIFIER
P513
K505

Figure 11-3. Amplifier-Oscillator AM-776A/ARC-21, Motor Drive Side

11-19. Further trouble shooting information is provided in the voltage chart, table LIV and the stage gain chart, table LV.

11-20. DISMANTLING.

11-21. Before the tuning boxes can be dismounted from the assembly for servicing or repair it will be necessary to remove the common shaft that drives the band switches in the boxes. This can be done by first loosening the band indicating dial on the end of the shaft and then withdrawing the shaft by grasping the gear on the other end. The shaft should be pulled straight out and care taken not to bend or nick the shaft before replacement. Any desired box can then be dismounted by removing the front cover, after which proceed as follows:

a. Antenna Amplifier. Disconnect leads to pins 1

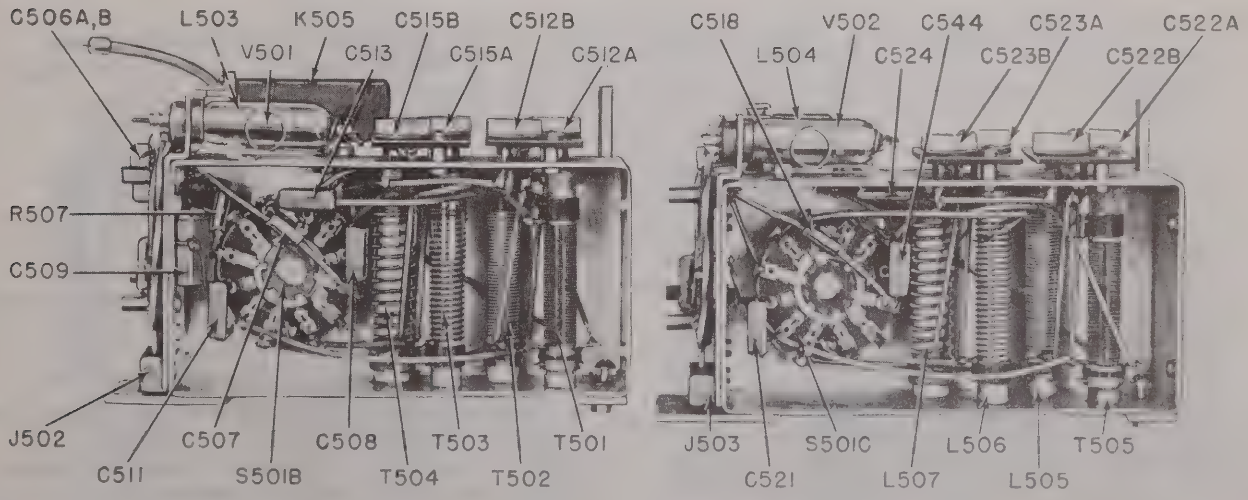

C506A,B
L503
K505
V501
C513
C515B
C515A
C512B
C512A
R507
C509
J502
C511
C507
S501B
C508
T504
T503
T502
T501
C518
V502
L504
C524
C544
C523A
C523B
C522A
C522B
J503
C521
S501C
L507
L506
L505
T505

Figure 11-4. Antenna Amplifier and R-F Amplifier Boxes

TABLE LIII. TROUBLE ANALYSIS, AMPLIFIER-OSCILLATOR AM-776A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 11-21

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Circuit Under Test
1	1* (J512)	Plug Multimeter ME-75/ARC-21 into jack. Set selector switch to position 4	On Radio Set Control C-451A/ARC-21, set controls for "VOICE" operation, "POWER" at "LOW", "CONTROL" at "ON." Press microphone button for transmit indication.	180 volts ± 20%	Screen grid voltage of tubes V512 and V513
2	1* (J512)	Selector switch at position 5	Same as step 1	+120 volts	Keyed plate and screen voltage for tubes V508, V509, V510, and V511
3	1* (J512)	Selector switch at position 6	Same as step 1	13.5 volts	Tap of heater string including tubes V508,V509, V510, V511, V514. Use position 10 when using a-c supply
4	1* (J512)	Selector switch at position 7	Same as step 1 Press microphone button for transmit	-20 volts receive 0 transmit	Cut-off bias for tubes V508, V509, V510, and V511
5	1* (J512)	Selector switch at position 8	Rotate "CHANNEL" switch to another channel	+1.5 volts transmit	D-c error signal. Same voltage measured by both positions but position 8 is positive polarity and position 9 is negative polarity.
6	1* (J512)	Selector switch at position 9	Same as step 5	Same as step 5	
7	Pin 4 of V508	Voltmeter TS-375/U, use a-c probe MX-661/U. Set for 12-V scale.	Same as step 1	4 volts minimum (Oscillator-buffer output)	Output of tube V507
8	L** (Pin 1 of V508)	Same as step 7	Same as step 1	0.9 to 1.75 volts (900-kc injection voltage)	T507 output voltage
9	M** (Pin 1 of V509)	Same as step 7	Same as step 1	Same as step 8	T507 output voltage

* Major test point. ** Minor test point.

and 5 of K501 and lead to terminal 1 of E502. Uncouple coaxial cable, P513, from J2006. Remove the two screws in lower foot member of the box and the screw in the interior-rear by inserting a screwdriver through the hole in the top of the box. Remove side handle loosening the two screws holding it. Release box from the assembly by detaching it from P502 into which it is plugged. Replace box by reversing above procedure, being careful to correctly engage cores as box is placed on platform.

b. R-F Amplifier. Disconnect leads at terminal 1 of E502 and terminal 1 of E503. Release box by removing screws as in step a and withdraw the box from connector P503. Mount the box by reversing the above procedure.

c. Mixer. Disconnect leads from terminals 1 and 4

TABLE LIV. VOLTAGE CHART, AMPLIFIER-OSCILLATOR AM-776A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Voltmeter TS-352/U

Tube		Control Position	Pin Number							
Symbol	Type		1	2	3	4	5	6	7	8
V501	-5899	"VOICE"	0		0		109	6.6	108	1.55
		"CW"	-0.05	-	0	-	110	6.6	109	1.24
V502	-5899	"VOICE"	0		6.6		109	13.2	108	1.55
		"CW"	-0.18	-	6.6	-	110	13.2	109	1.24
V503	-5636	"VOICE"	0		19.2	0.2	115	13.2	80	1.1
		"CW"	0	-	19.1	0.2	115	13.2	80	1.1
V504	-5840	"VOICE"	-1.8	0	12.2		112	6.2	43	
		"CW"	-1.8	0	12.2	-	112	6.2	43	-
V505	-5840	"VOICE"	7.1		6.3		70	0	70	15
		"CW"	7.1	-	6.3	-	70	0	70	15
V506	-5840	"VOICE"	-4.05	0	12.6		70	18.5	70	
		"CW"	-4.05	0	12.6	-	70	18.5	70	-
V507	-5636	"VOICE"	2.8		18.5		111	24.5	114	12.9
		"CW"	2.8	-	18.5	-	111	24.5	114	12.9
V508	-5636	Receive	-20	0	13	0	0	6.2	0	-
		"HI-POWER" keyed	0	1.35	13	-6.8	110	6.15	101	-
		"LO-POWER" keyed	0	1.4	13	-6.9	114	6.3	102	-
V509	-5636	Receive	-20.5	-	6.2	0	0	0	0	0
		"HI-POWER" keyed	0	-	6.2	-6.8	110	0	101	1.4
		"LO-POWER" keyed	0	-	6.3	-6.9	113	0	103	1.4
V510	-5902	Receive	-19.2	0	13	-	0	-19.5	0	-
		"HI-POWER" keyed	0	12.5	13	-	104	19.5	114	-
		"LO-POWER" keyed	0.05	12.5	13	-	106	19.5	115	-
V511	-5902	Receive	-19.5	-	19.5	-	0	25.5	0	0
		"HI-POWER" keyed	0	-	19.5	-	114	25.2	110	11.2
		"LO-POWER" keyed	0	-	19.9	-	115	26	112	11.5
V512	-2E26	Cannot be measured								
V513	-2E26	Cannot be measured								
V514	-5896	Receive	-0.25	0	0	0	-0.25	6.2	0	-
		"HI-POWER" keyed	-10.8	0	0	0	-14	6.1	-0.15	-
		"LO-POWER" keyed	-11	0	0	0	-13	6.3	-1.15	-

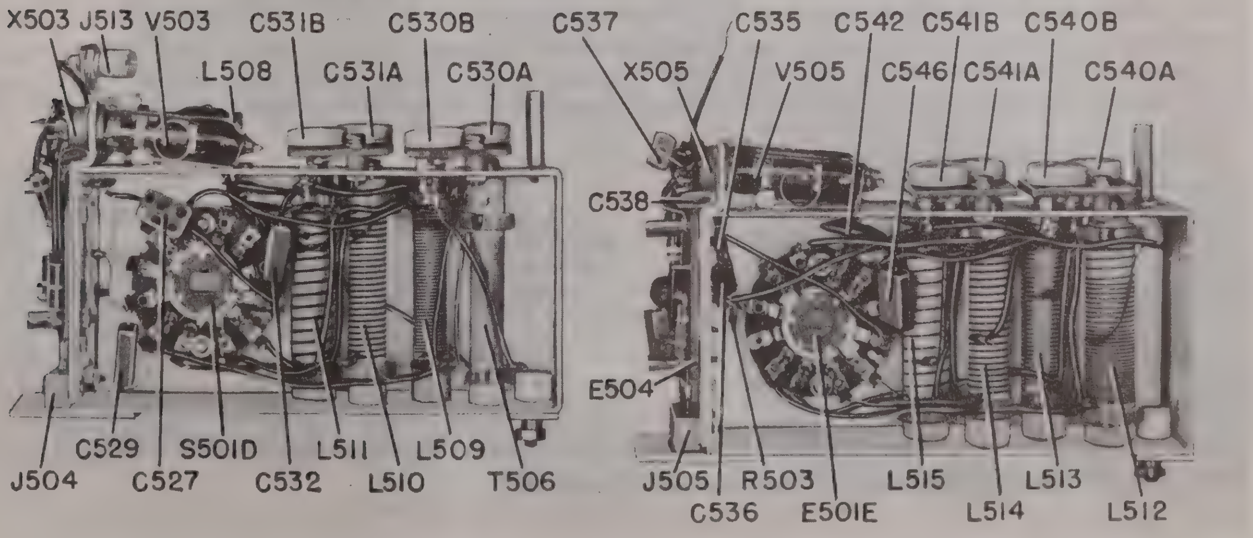

X503
J513
V503
C531B
C530B
C537
C535
C542
C541B
C540B
L508
C531A
C530A
X505
V505
C546
C541A
C540A
C538
E504
C529
S501D
L511
L509
J504
C527
C532
L510
T506
J505
R503
L515
L513
C536
E501E
L514
L512

Figure 11-5. Mixer and Doubler-Reactor Boxes

TABLE LV. STAGE GAIN CHART, AMPLIFIER-OSCILLATOR AM-776A/ARC-21

Conditions:
- a. Install in operating position.
- b. Remove front cover of antenna amplifier, r-f amplifier, mixer oscillator-buffer and 2nd amplifier boxes.
- c. Remove top cover of balanced modulator, 1st and 2nd amplifiers, and push-push doubler.
- d. "CW SHARP-CW BROAD-VOICE-FSK" at "VOICE." "NOISE" maximum clockwise.
- e. All voltages measured to ground.

Maximum input voltage, in microvolts, required to give 1 volt output at pin A of terminal board E717 on Amplifier-Detector AM-777A/ARC-21. Measured with Voltmeter TS-375/U using d-c probe.

Band	Frequency in Mc	To P513 (Minor Test Point A) With 47-ohm Series Carbon Resistor	To Pin 1 of (Minor Test Point B) of E501	To pin 1 of (Minor Test Point C) of E502	To Pin 1 of (Minor Test Point D) of E503
1	3.600	1.35	10.5	60	300
2	6.600	2.4	16.5	96	300
3	12.200	1.9	11	85	300
4	19.600	2.7	10	80	300

		Voltmeter TS-375/U using d-c probe in series with 2.7-megohm, 1/2-watt resistor			Voltmeter TS-375/U using a-c probe
Band	Frequency in Mc	TP-O (Minor Test Point E) (Min)	TP-M (Minor Test Point F) (Min)	J501 With Cable	TP-B (Minor Test Point G)
1	2.0	5.5	6	0.65-1.0	6-12
2	5.0	5	3.5	0.65-1.0	6-11
3	9.0	4.5	7	0.65-1.0	5-10
4	16.0	5	5	0.65-1.1	4-10

Check the push-pull 900-kc input at pin 1 of both X508 and X509. Voltage to be 1.0 + 0.75, -0.2 volts to ground using Voltmeter TS-375/U with a-c probe. Oscillator injection to be satisfactory as measured at TP-B, minor test point G above. Use Voltmeter TS-375/U with 5 uuf capacitor in series with a-c probe (approximately 3 to 1 attenuation).

Band	Frequency in Mc	Pin 1 of X510 (Minor Test Point H)	Pin 1 of X511 (Minor Test Point I)	R-f Output Term. on E508 Each Term. to Ground	ME-75/ARC-21 in J403 Switch Position Number 1
1	2.8	0.6	4.1	6.5	40
2	6.6	0.9	6.2	8.0	44
3	12.2	1.0	8.0	10	35
4	19.6	0.8	6.2	12	20

Allowable voltage variation (with nominal line voltage) ±20 percent.

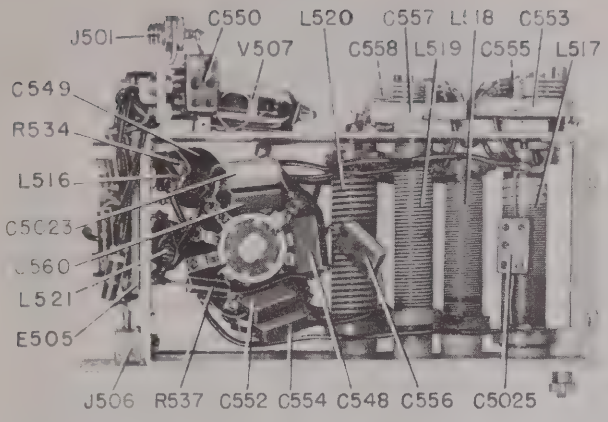

J501
C550
V507
L520
C557
L518
C553
C558
L519
C555
L517
C549
R534
L516
C5023
C560
L521
E505
J506
R537
C552
C554
C548
C556
C5025

Figure 11-6. Oscillator-Buffer Box

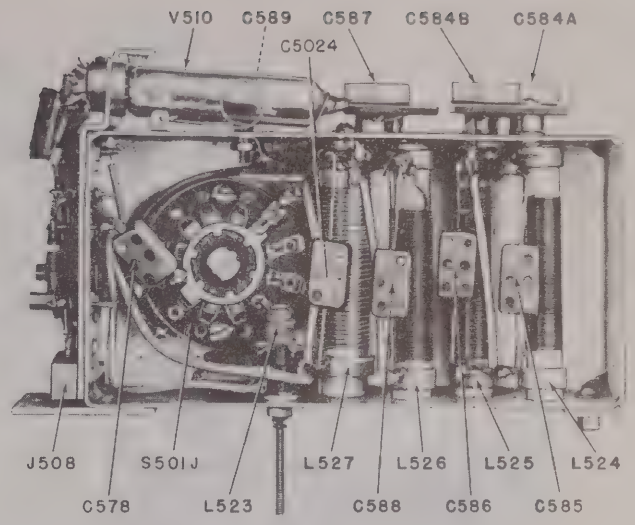

V510
C589
C587
C584B
C584A
C5024
J508
S501J
L527
L526
L525
L524
C578
L523
C588
C586
C585

Figure 11-8. First Amplifier Box

of E503 and coaxial cable from jack J513. Remove mounting screws as in step a and withdraw the box from P504. Mount the box by reversing the above operation. Replace coaxial cable on jack J513.

d. Doubler-Reactance. Disconnect leads from terminals 1 and 5 of E504 and from pin 5 of X505. Dismount box by removing screws as in step a and disengage the box from P505. Replace the box by a reverse procedure.

e. Oscillator-Buffer. Disconnect leads from terminals 1, 8 and 9 of E505, and coaxial cable connector P1202 from J501. Remove mounting screws as in step a and withdraw box connector from P506. Install the box by reversing the operation.

f. Balanced Modulator. Disconnect leads from terminals 3 and 4 of E506 and uncouple coaxial cable connector P1203 from J511. Remove screws as in step a and disengage box from P507. Reverse the procedure to mount the box.

g. First Amplifier. Disconnect leads from pins 1 and 3 of E507. Release the box by removing screws as in step a and withdraw from P508. Reverse the operation to remount the box.

h. Second Amplifier. Unsolder leads from terminals 1, 4, and 7 of E508. Detach box by removing screws as in step a and withdrawing from connector P509. Mount the box by performing the above in the reverse order.

i. Doubler-Phase Detector. This box cannot be removed without first dismounting the Second Amplifier. See step h. Disconnect leads from terminals 4, 5, 8 (two leads), and 9 of E512. Mark leads so proper reconnection can be made. Dismount box by releasing screws as in paragraph a and disengage the box from

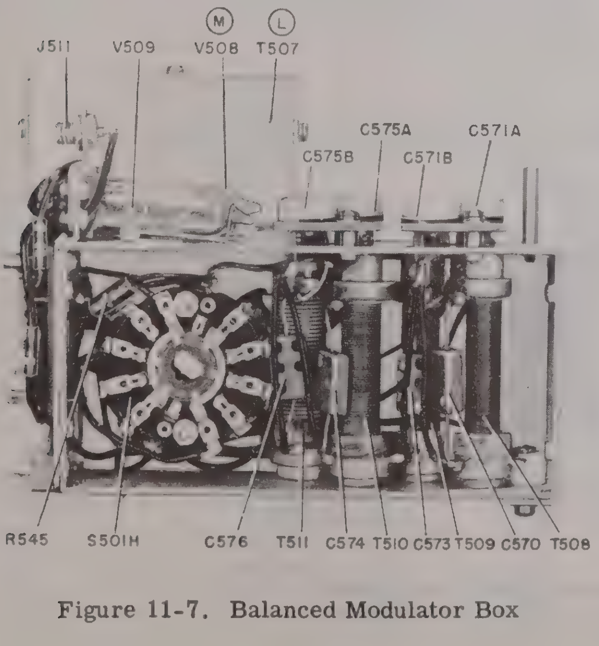
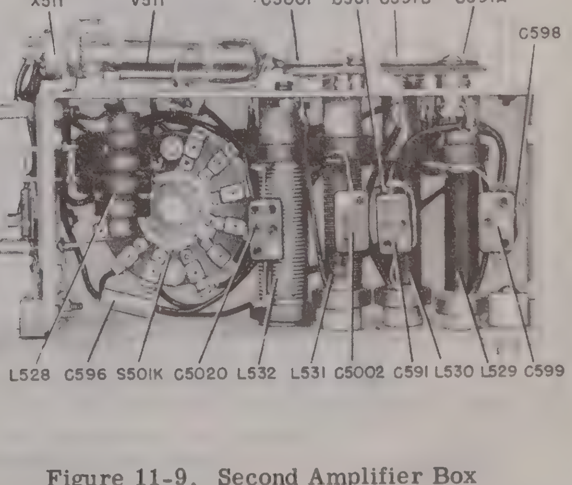

Ⓜ
Ⓛ
J511
V509
V508
T507
C575A
C571A
C575B
C571B
R545
S501H
C576
T511
C574
T510
C573
T509
C570
T508

Figure 11-7. Balanced Modulator Box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V511
C5001
C561
C597B
C597A
C598
L528
C596
S501K
C5020
L532
L531
C5002
C591
L530
L529
C599

Figure 11-9. Second Amplifier Box

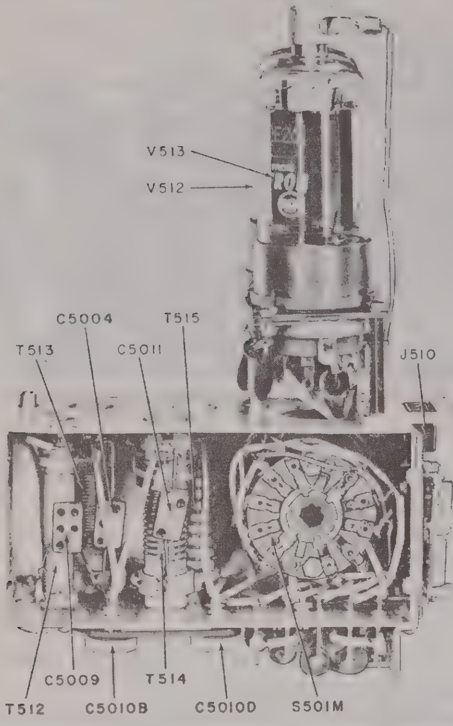


Figure 11-10. Push-Push Doubler Box

P510. Take care not to damage the tube mounting assembly, at the bottom of the box, as it is removed. Carefully reverse the above to install the box.

CAUTION

When replacing the shaft do not force it into position. Rock it slightly to engage each switch wafer in turn as it is pushed into place, engage gearing, and replace the band indicating dial.

11-22. ALIGNMENT, ADJUSTMENT, AND CHECKS.

11-23. GENERAL. Paragraphs 11-27 through 11-45 describe alignment, adjustment and checking procedures for Amplifier-Oscillator AM-776A/ARC-21.

11-24. Table LXII is a maintenance check list summarizing maintenance procedures for this component. It lists lubrication and preliminary inspection procedures, and summarizes all alignments, adjustments, and tests that will assure field maintenance personnel that a repaired Amplifier-Oscillator AM-776A/ARC-21 meets minimum acceptable standards of performance. Table LXII may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

11-25. MASTER OSCILLATOR ALIGNMENT, AMPLIFIER OSCILLATOR AM-776A/ARC-21

NOTE

Do not change the settings of the tuning cores since they have been factory adjusted for optimum performance.

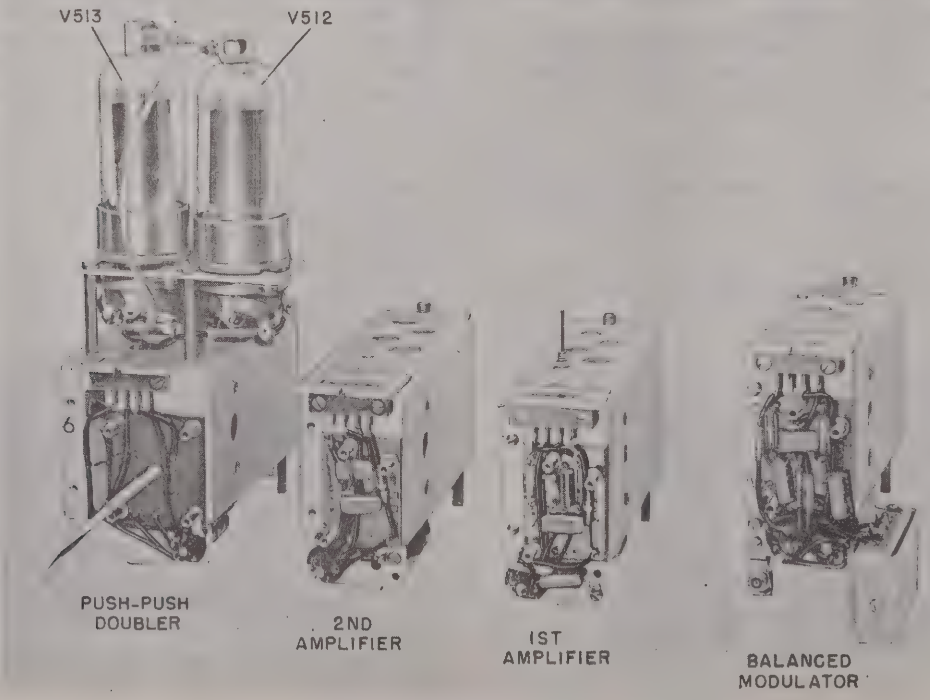
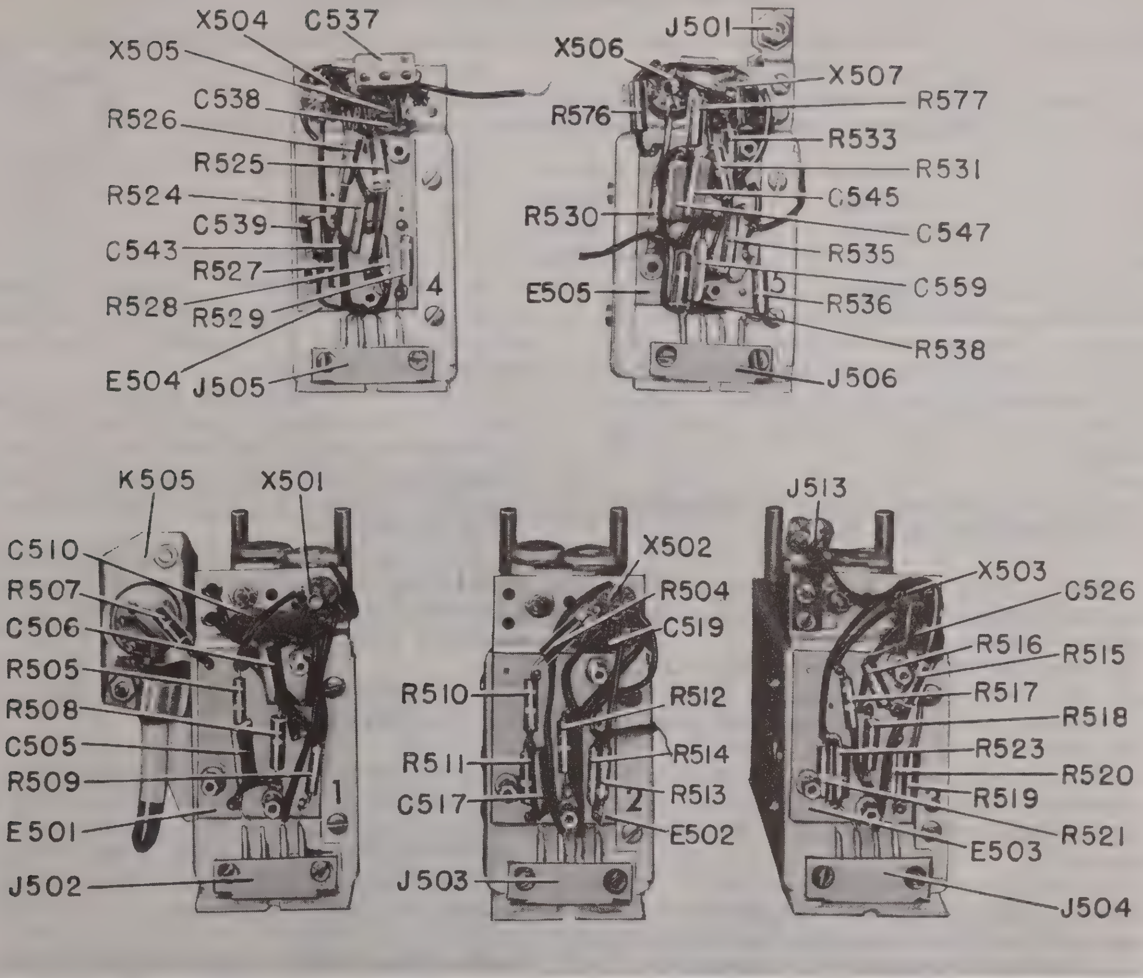


Figure 11-11. Push-Push Doubler, First and Second Amplifier, and Balanced Modulator Boxes, End View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C537
X505
C538
R526
R525
R524
C539
C543
R527
R528
R529
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X507
R577
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R533
R531
C545
R530
C547
R535
E505
C559
5
R536
R538
J506
K505
X501
C510
R507
C506
R505
R508
C505
R509
1
E501
J502
X502
R504
C519
R510
R512
R511
R514
C517
R513
2
E502
J503
J513
X503
C526
R516
R515
R517
R518
R523
R520
R519
3
R521
E503
J504

Figure 11-12. Doubler, Oscillator, Antenna Amplifier, R-F Amplifier, and Mixer Boxes, End View

11-26. Realignment will be required if either the oscillator tube, V506, or the doubler tube, V505, has been changed or both receiver sensitivity and exciter power output are insufficient. Proceed as follows:

a. Disengage the clutch O501 by turning the slotted shaft to the "MANUAL" position. Move the platform to the high-frequency stop. The dial should read 630.0 Reengage the clutch.

TABLE LVI. DIAL SETTINGS FOR LIMIT SWITCH CHECK AND ADJUSTMENT

Conditions:
Amplifier-Oscillator AM-776A/ARC-21 on bench with backlash spring disabled by "C" washer.
"MANUAL-AUTOMATIC" clutch turned to "MANUAL."

Nominal Dial Reading	Direction of Approach	Tolerance (Divisions)	Remarks
630	-	±0.5	High-frequency stop. Set dial
580	Upward	-0, +2	Set high-frequency limit switch S502
570	Downward	-0, +12	Set high-frequency limit switch S502
55	Upward	+0, -10	Check low-frequency limit switches S503, S505
50	Downward	-2, +10	Set low-frequency limit switch S503
40	Downward	±3	Set auxiliary low-frequency limit switch S505
10	-	approx	Low-frequency stop

TABLE LVII. OSCILLATOR ALIGNMENT

Band	Channel Frequency in Mc	Platform Dial Reading	Adjust Trimmer
1	3.6	408	C553
2	6.6	307	C555
3	12.2	325	C557
4	19.6	318	C558

b. Set up the frequencies, given in Table LVII in the Radio Set Control C-451A/ARC-21 and select the channels in turn. The platform dial should read within one division, as listed on the table. If it does not, adjust the corresponding trimmer and recycle. Repeat until the platform dial reads correctly for each band after recycle.

11-27. DOUBLER ALIGNMENT, AMPLIFIER-OSCILLATOR AM-776A/ARC-21.

11-28. If either the doubler, V505, or mixer, V503, tubes have been changed, it may be necessary to retune the doubler trimmers as follows:

a. Set the Voltmeter TS-375/U meter on the -12-volt d-c scale. Use the d-c probe in series with a 2.7-megohm, 1/2-watt carbon resistor connected to minor test point F, TP-M on terminal board E504.

b. Set up the frequencies given in table LVIII in the Radio Set Control C-451A/ARC-21 and select the channels in turn. Tune the corresponding trimmer for maximum output.

TABLE LVIII. DOUBLER ALIGNMENT

Band	Channel Frequency in Mc	Adjust Trimmer
1	3.6	C540A
2	6.6	C540B
3	12.2	C541A
4	19.6	C541B

11-29. RECEIVER R-F TUNER CIRCUITS ALIGNMENT, AMPLIFIER-OSCILLATOR AM-776A/ARC-21.

NOTE

Avoid changing core settings, as they have been factory adjusted for optimum performance.

11-30. Signal Generator TS-413/U and Voltmeter TS-375/U will be required for the alignment of the antenna amplifier, r-f amplifier, and mixer which is performed as follows:

a. Connect the TS-413/U generator through a 47-ohm, 1/2-watt carbon resistor to jack J2002.

b. With Voltmeter TS-375/U on the + 12-volt d-c scale, connect the d-c probe to test pin A, minor test point N on terminal board E717 of Amplifier-Detector AM-777A/ARC-21.

c. Tune trimmer for minimum indication on the meter with no modulation on generator output. Keep generator output low enough so meter reads between +1 and +6 volts. Use table LIX as a guide.

11-31. ADJUSTMENT OF 900-KC INPUT TRANSFORMER T507.

11-32. Connect a-c probe of Voltmeter TS-375/U to pin 1 of either tube V508 or V509. Using the teflon tuning tool clipped to Chassis, Receiver-Transmitter MX-1424A/ARC-21, adjust the cores of inductors L533 and L534 for maximum voltage reading. Transmitter must be on for this adjustment.

11-33. ALIGNMENT OF BALANCED MODULATOR, FIRST AMPLIFIER, SECOND AMPLIFIER, AND PUSH-PUSH DOUBLER.

11-34. Alignment of the balanced modulator, first amplifier, second amplifier, and push-push doubler involves adjusting the individual trimmers for maximum drive into the power amplifier tubes V401 and V402. The transmitter must be on. Proceed as follows:

NOTE

Do not change core settings as these have been factory adjusted for optimum performance.

a. Install the Amplifier-Oscillator AM-776A/ARC-21 in the Chassis, Receiver-Transmitter MX-1424A/ARC-21.

TABLE LIX. R-F TUNER ALIGNMENT

Band	Set AN/ARC-21 and TS-413/U to	Tune for Minimum Meter Indication		
		Antenna Amplifier	R-F Amplifier	Mixer
1	3.6 mc	C512A	C522A	C530A
2	6.6 mc	C512B	C522B	C530B
3	12.2 mc	C515A	C523A	C531A
4	12.6	C515B	C523B	C531B

TABLE LX. EXCITER ALIGNMENT

Switch Transmitter To	Bal. Mod.	Peak for Maximum Output		
		First Amplifier	Second Amplifier	Doubler
4.9995 mc	C571A	C584A	C597A	C5010A
8.9995 mc	C571B	C584B	C597B	C5010B
15.9995 mc	C575A	C587	C5001	C5010C
23.9995 mc	C575B	C589	C5003	C5010D

TABLE LXI. PHASE DETECTOR CORRECTION BIAS

Frequency (Mc)	Bias (+) Low Power	Bias (+) High Power	Frequency (Mc)	Bias (+) Low Power	Bias (+) High Power
2	0.6	1.5	9	0.6	1.5
3	2	4.5	10	2	4.5
4	4	9	11	2	4.5
4.999	4	9	12	2	4.5
			13	2	4.5
5	0.60	1.5	14	2	4.5
6	2	4.5	15	2	4.5
7	2	4.5	15.999	2	4.5
8	2	4.5			4.5
8.999	2	4.5	16	0	0
			17 to 23.999	0	4.3

b. Plug the cord of Multimeter ME-75/ARC-21 into major test point 3, jack J403, on Amplifier, Radio Frequency AM-774A/ARC-21 chassis and set the meter selector switch to position "1". At this setting the meter will indicate grid current drive on the power amplifier tubes, V401 and V402.

c. Set up frequencies on Radio Receiver-Transmitter RT-128A/ARC-21 and adjust trimmers as given in table LX for maximum indication on the meter.

11-35. PHASE DETECTOR, V514, CIRCUITS.

11-36. Since these circuit functions give different output values depending on frequencies involved and tuning variations, trouble shooting will depend on circuit checking and observation of conditions as described in the following paragraphs.

11-37. With the Amplifier-Oscillator AM-776A/ARC-21 in the Chassis, Receiver-Transmitter MX-1424A/ARC-21, change to another channel. This will cause the power amplifier tuning coil L403, roller to go to the "home" (maximum inductance) end of the coil. As the coil roller leaves the "home" position, Multimeter ME-75/ARC-21 will read up-scale on position "8" of the meter selector switch. This voltage will be the sum of the phase detector correction bias and the "built-in" error voltage of the detector.

11-38. As the plate tuning coil nears resonance, the error signal voltage will sharply drop through zero (as the plate tuning circuit is exactly in resonance) to the opposite polarity. The meter will now read down-scale in position "8" or up-scale on position "9."

11-39. The servo amplifier will now drive the clutches to return the tank circuit to resonance reducing the phase detector error signal to zero. The error signal will remain about zero as the plate circuit loading is completed. When the tuning and loading is completed the error voltage will be very nearly zero and the transmitting tuning mechanism will shut down.

11-40. Table LXI gives the values of phase detector correction bias from the Selector Control Sub-assembly MX-1425A/ARC-21. This voltage can be measured by plugging the Multimeter ME-75/ARC-21 into jack J512, major test point 1, and setting the multimeter switch to position "8." Voltages will be the same in either cw or voice operation with key up or the microphone "push-to-talk" button released.

11-41. MINIMUM PERFORMANCE STANDARDS.

11-42. On completion of repairs and alignment, the Amplifier-Oscillator AM-776A/ARC-21 should be checked in the operating position to assure it conforms to the minimum acceptable standards.

11-43. TUNING OPERATION. Tuning will be checked as the receiver performance is checked at the high- and low-frequency ends of each of the four bands. Rapid and accurate tuning constitutes the performance specification.

11-44. RECEPTION. Check the receiver section at the high-and low-frequency ends of each of the four bands. An output of 50 milliwatts should be obtained

TABLE LXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-OSCILLATOR AM-776A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
1. Chassis, Components	Dents, cracks, bent pins, corrosion, stripped threads, dirt, dust,discoloration, burned or deteriorated insulation.
2. Gearing and Moving parts	Stripped or chipped teeth, deep scratches, sticky or uneven operation, illegible dial divisions

II. LUBRICATION

Figure	Nomenclature	Lubricant	Period	Application
11-3	Rack	Oil MIL-C-8188	500 hours and on assembly	Light brush coat on all bearing surfaces (both ends) and teeth. Operate rack through entire travel to lubricate mating gears. Remove excess with lint-free wiper
11-2	Solenoid O501	Oil MIL-C-8188	500 hours and on assembly	One drop on each portion of shaft extending through plate on end opposite solenoid body

III. ALIGNMENT

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. Master Oscillator	11-25	-	-	Transmitter Tune-Up	-	-	-	Adjust trimmer capacitors for correct platform dial reading (table LVII)
2. Doubler	11-27	-	-	Transmitter Tune-Up	TS-375/U	E504, TP-M	Max. Reading	Adjust trimmer capacitors (table LVIII)
3. Receiver R-f Tuner Circuits	11-29	TS-413/U	J2002	See table LIX	TS-375/U	E717 TP-A	Min. Reading	Adjust trimmer capacitors (table LIX)
4. T507	11-31	-	-	Transmitter ON	TS-375/U	V508-1 or V509-1	Max. Reading	Adjust L533 and L534
5. Balanced Modulator 1st and 2nd Amplifiers Push-Push Doubler	11-33	-	-	Transmitter ON	ME-75/ARC-21	J403	Max. Reading	Meter Selector switch in position "1". Adjust trimmer capacitors (table LX)
6. Phase Detector	11-35	-	-	Transmitter Tune-up	ME-75/ARC-21	J512	Varies	Meter Selector switch in position "1". See table LXI for values.

TABLE LXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-OSCILLATOR AM-776A/ARC-21 (continued)

IV. PERFORMANCE STANDARDS

Measurement	Input	Output	Remarks
Tuning	-	-	Check for rapid, accurate tuning at high and low ends of band.
Reception Audio Output	5uv, 30- percent modulated at 1000 cycles	50 MU	Audio output
	5uv, unmodulated	Less than 5 MU (10 db down from output with modulated signal)	Audio output
Squelch	3.5uv or less	Squelch opens	
Transmission PA Grid Current		28 ma.	Connect ME-75/ARC-21 to J403, selector switch to position "1" Power Switch in "HI".

with a 5-microvolt input signal modulated 30 percent at 1000 cycles. Remove the modulation, and the audio output should drop 10 db (to less than one-tenth its former power output). The signal required to open the squelch should not exceed 3.5 microvolts.

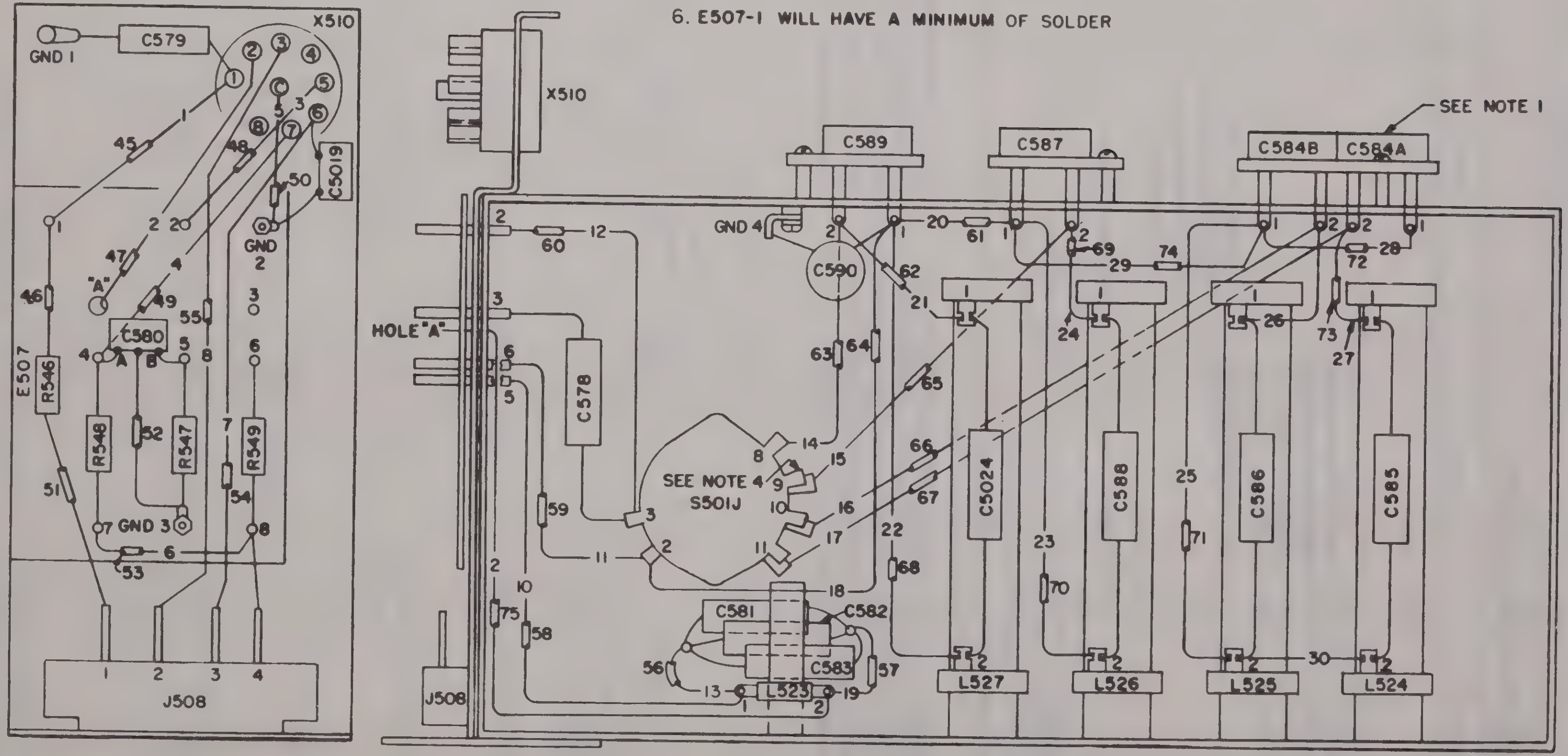
11-45. TRANSMISSION. Plug the Multimeter ME-75/ARC-21 into jack J403. Set the selector switch to position 1. The correct value is given on the meter chart. This value should be met at the high- and low-frequency ends of each band.

NOTES:

1. BOTTOM VIEW OF C589, C587, C584A AND C584B AS SHOWN →

2. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
3. ON WAFER SWITCH (S501J) THE FRONT AND REAR TERMS OF 9, 10 & 11 ARE TO BE JOINED BY A SOLDERED ELEC. CONNECTION.
4. S501J IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
5. SLEEVING WILL BE DRESSED AWAY FROM E507-3.
6. E507-1 WILL HAVE A MINIMUM OF SOLDER

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 8	WIRE, TINNED COPPER .0159 DIA
10 - 30	WIRE, TINNED COPPER .0254 DIA
45 - 75	SLEEVING, FIBERGLASS BRN .022 ID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GND 1
C579
C5019
E507
R546
R548
R547
R549
C580
A
B
"A"
GND 2
GND 3
J508
45
46
47
48
49
50
51
52
53
54
55
X510
HOLE "A"
SEE NOTE 1
C589
C587
C584B
C584A
GND 4
C590
SEE NOTE 4
S501J
C578
C581
C582
C583
L523
C5024
C588
C586
C585
L527
L526
L525
L524
J508
20
21
22
23
24
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26
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29
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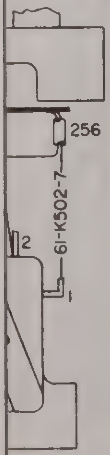
72
73
74
75

Figure 11-13. First Amplifier Box, Connection Diagram

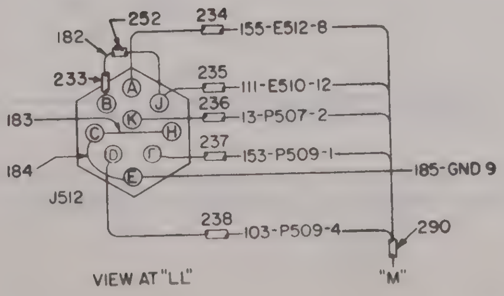
WIRE TABLE

WIRE NO. (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR				
1-2	WIRE	WHT		AWG 24	600V
10-15			BRN-TR		
15-28			RED-TR		
30-32			ORN-TR		
35-36			BLK/BRN-TR		
40-43			BLK-TR		
46-47			GRN-TR		
50-52			YEL-TR		
55-56			BLU-TR		
60-62			BLK/GRN-TR		
65-66			BLK/RED-TR		
70-71			BRN/RED-TR		
75			BRN/GRN-TR		
80-81			BRN/BLU-TR		
85-86			RED/BLK-TR		
90-92			RED/GRN-TR		
95-96			RED/BLU-TR		
100-103			YEL/BLK-TR		
105-106			YEL/RED-TR		
110-111			YEL/GRN-TR		
115-116			GRN/BLK-TR		
120-121		WHT	GRN/BRN-TR		
130		YEL			
135-136		WHT	GRN/RED-TR		
140-141		WHT	BLU/BRN-TR		
145-146		WHT	BLU/BLK-TR		
150-154		RED			
155-156		BRN			
160-161		GRN			
165-166		ORN			
172	WIRE	BLU		AWG 24	600V
181-198	WIRE TIN COPPER .020 DIA.				
234-239	SLEEVING BRN .042 I.D				
242-254	SLEEVING BRN .022 I D				
255-257	SLEEVING BRN .118 I D.				
233	SLEEVING BRN .066 I D.				
290	SLEEVING BRN .118 I.D.				
300	WIRE TIN COPPER .032 DIA				
325	CABLE SHIELDED WHT				
330	SLEEVING BRN .085 I.D.				
340	SLEEVING BRN .452 I.D.				


256
61-K502-7
2
1

NOTE 1

COMPONENTS ON E510 MUST NOT PROTRUDE BEYOND BOARD BY MORE THAN 1/16".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A
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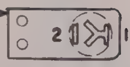
111-E510-12
B
J
236
183
K
13-P507-2
C
H
237
D
F
153-P509-1
184
E
185-GND 9
J512
238
103-P509-4
290
VIEW AT "LL"
"M"

er-Oscillator AM-776A/ARC-21, Frame, Connection Diagram

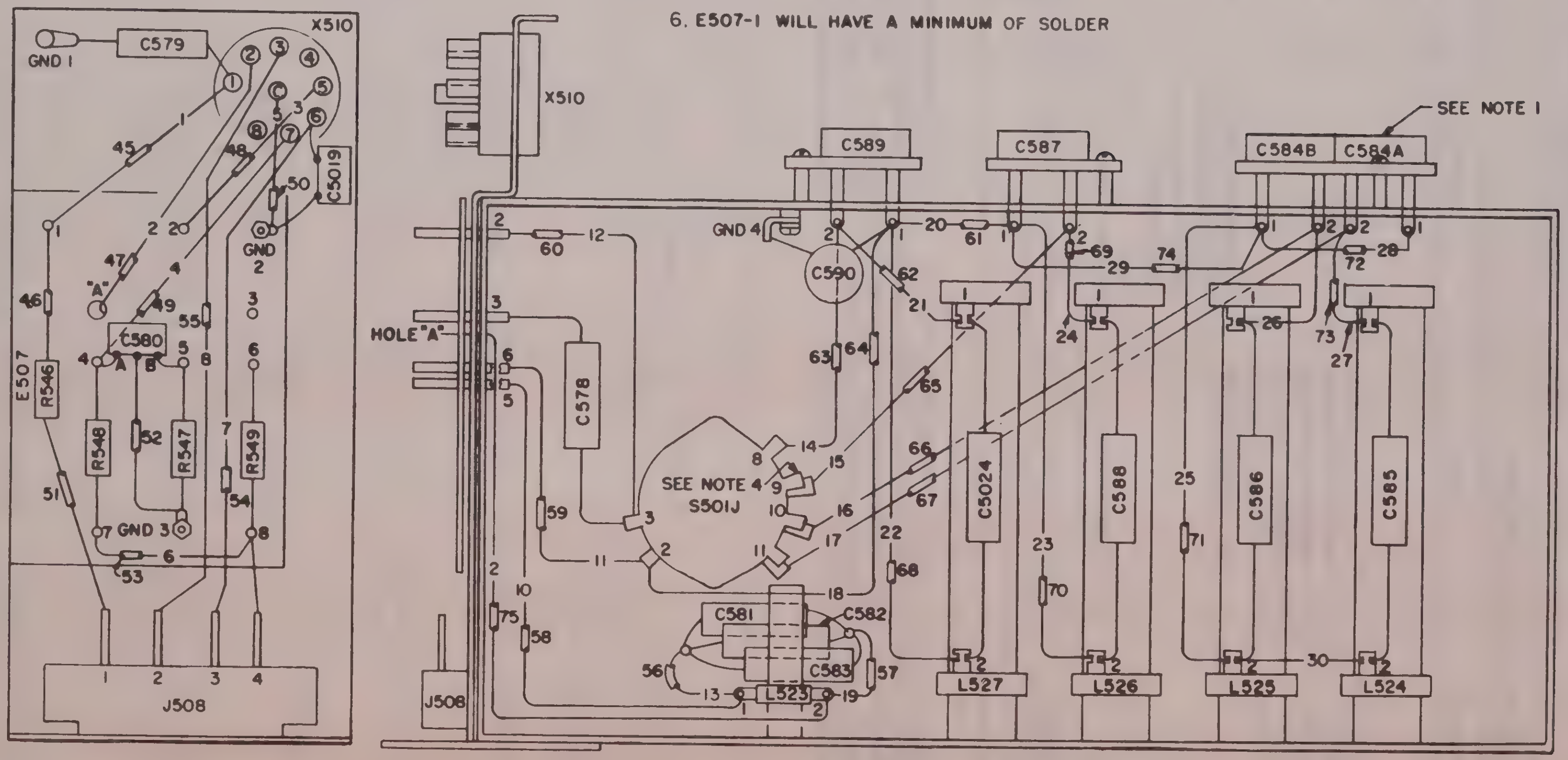
NOTES:

1. BOTTOM VIEW OF C589, C587, C584A AND C584B AS SHOWN →



2. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
3. ON WAFER SWITCH (S501J) THE FRONT AND REAR TERMS OF 9,10 & 11 ARE TO BE JOINED BY A SOLDERED ELEC. CONNECTION.
4. S501J IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
5. SLEEVING WILL BE DRESSED AWAY FROM E507-3.
6. E507-1 WILL HAVE A MINIMUM OF SOLDER

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 8	WIRE, TINNED COPPER .0159 DIA
10 - 30	WIRE, TINNED COPPER .0254 DIA
45 - 75	SLEEVING, FIBERGLASS BRN .022 ID


GND 1
C579
X510
1
2
3
4
5
6
7
8
C
45
48
50
C5019
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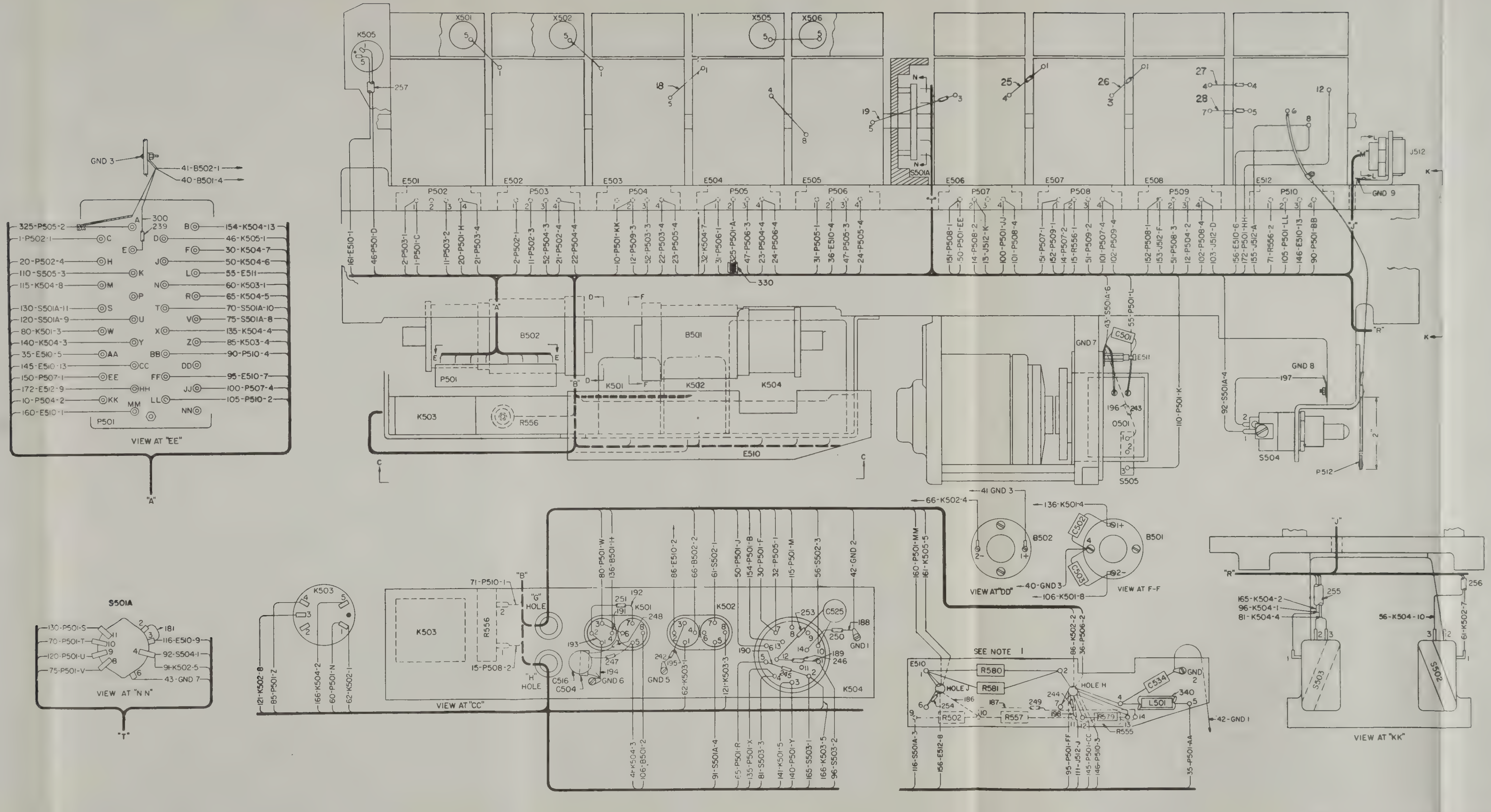
"A"
49
55
GND 2
3
6
4
A
B
C580
5
8
E507
R546
R548
52
R547
7
R549
51
54
7 GND 3
8
6
53
J508
1
2
3
4
X510
HOLE "A"
J508
60
12
2
3
6
5
C578
59
11
10
75
58
GND 4
C589
C590
20
61
C587
69
29
74
C584B
C584A
SEE NOTE 1
28
72
62
21
24
26
73
27
63
64
65
SEE NOTE 4
S501J
14
15
16
17
18
66
67
C5024
C588
C586
C585
22
68
23
70
25
71
30
C581
C582
C583
56
57
13
L523
19
L527
L526
L525
L524

Figure 11-13. First Amplifier Box, Connection Diagram


K505
X501
X502
X505
X506
S501A
E501
E502
E503
E504
E505
E506
E507
E508
E512
P502
P503
P504
P505
P506
P507
P508
P509
P510
J512
GND 9
GND 3
41-B502-1
40-B501-4
330
B502
B501
P501
K501
K502
K504
K503
R556
E510
GND 7
C501
E511
GND 8
S504
S505
P512
VIEW AT "EE"
"A"
S501A
VIEW AT "N N"
"T"
K503
VIEW AT "CC"
"G" HOLE
"H" HOLE
C516
C504
GND 5
GND 6
GND 1
SEE NOTE 1
HOLE J
HOLE H
R580
R581
R502
R557
R555
C534
L501
42-GND 1
VIEW AT "DD"
VIEW AT F-F
"R"
"J"
VIEW AT "KK"
S503
S502
K
C

WIRE TABLE			
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR		
1-2	WIRE WHT		AWG 24 600V
10-15		BRN-TR	
20-24		RED-TR	
30-32		ORN-TR	
35-36		BLK/BRN-TR	
40-43		BLK-TR	
46-47		GRN-TR	
50-52		YEL-TR	
55-56		BLU TR	
60-62		BLK/GRN-TR	
65-66		BLK/RED-TR	
70-71		BRN/RED-TR	
75		BRN/GRN-TR	
80-81		BRN/BLU-TR	
85-86		RED/BLK-TR	
90-92		RED/GRN-TR	
95-96		RED/BLU-TR	
100-103		YEL/BLK-TR	
105-106		YEL/RED-TR	
110-111		YEL/GRN-TR	
115-116		GRN/BLK-TR	
120-121	WHT	GRN/BRN-TR	
130	YEL		
135-136	WHT	GRN/RED-TR	
140-141	WHT	BLU/BRN-TR	
145-146	WHT	BLU/BLK-TR	
150-154	RED		
155-156	BRN		
160-161	GRN		
165-166	ORN		
172	WIRE BLU		AWG 24 600V
181-198	WIRE TIN COPPER .020 DIA		
234-239	SLEEVING BRN .042 I.D		
242-254	SLEEVING BRN .022 I.D		
255-257	SLEEVING BRN .118 I.D		
233	SLEEVING BRN .066 I.D		
290	SLEEVING BRN .118 I.D.		
300	WIRE TIN COPPER .032 DIA		
325	CABLE SHIELDED WHT		
330	SLEEVING BRN .085 I.D		
340	SLEEVING BRN .452 I.D		

NOTE 1

COMPONENTS ON E510 MUST NOT PROTRUDE BEYOND BOARD BY MORE THAN 1/16"

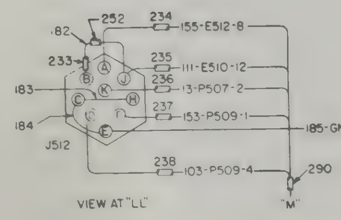
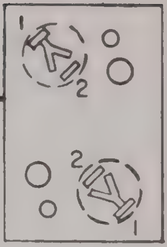

182
252
234
155-E512-8
233
235
111-E510-12
236
13-P507-2
183
237
153-P509-1
185-GND 9
184
J512
238
103-P509-4
290
VIEW AT "LL"
"M"

Figure 11-14. Amplifier-Oscillator AM-776A/ARC-21, Frame, Connection Diagram

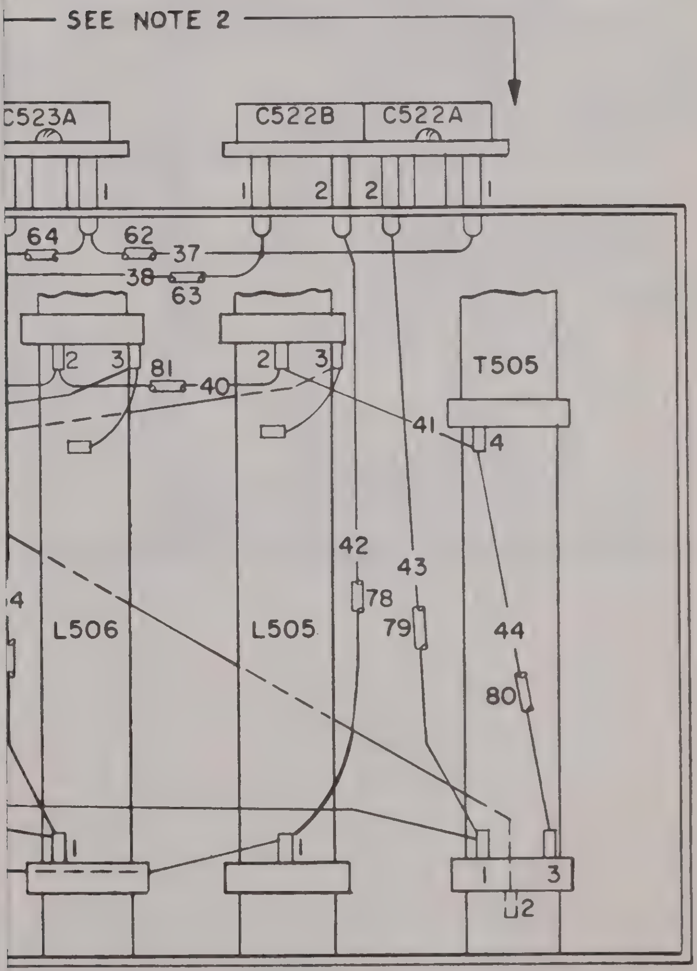
B AND C523A,B AS SHOWN



RMINALS 1,2,6,7,8,9 AND 12 ON
BY A SOLDERED ELECTRICAL

ROUND TERMINALS ONLY ONCE
44.

THAT THE FLATS
RUN THE LONG WAY OF THE BOX.

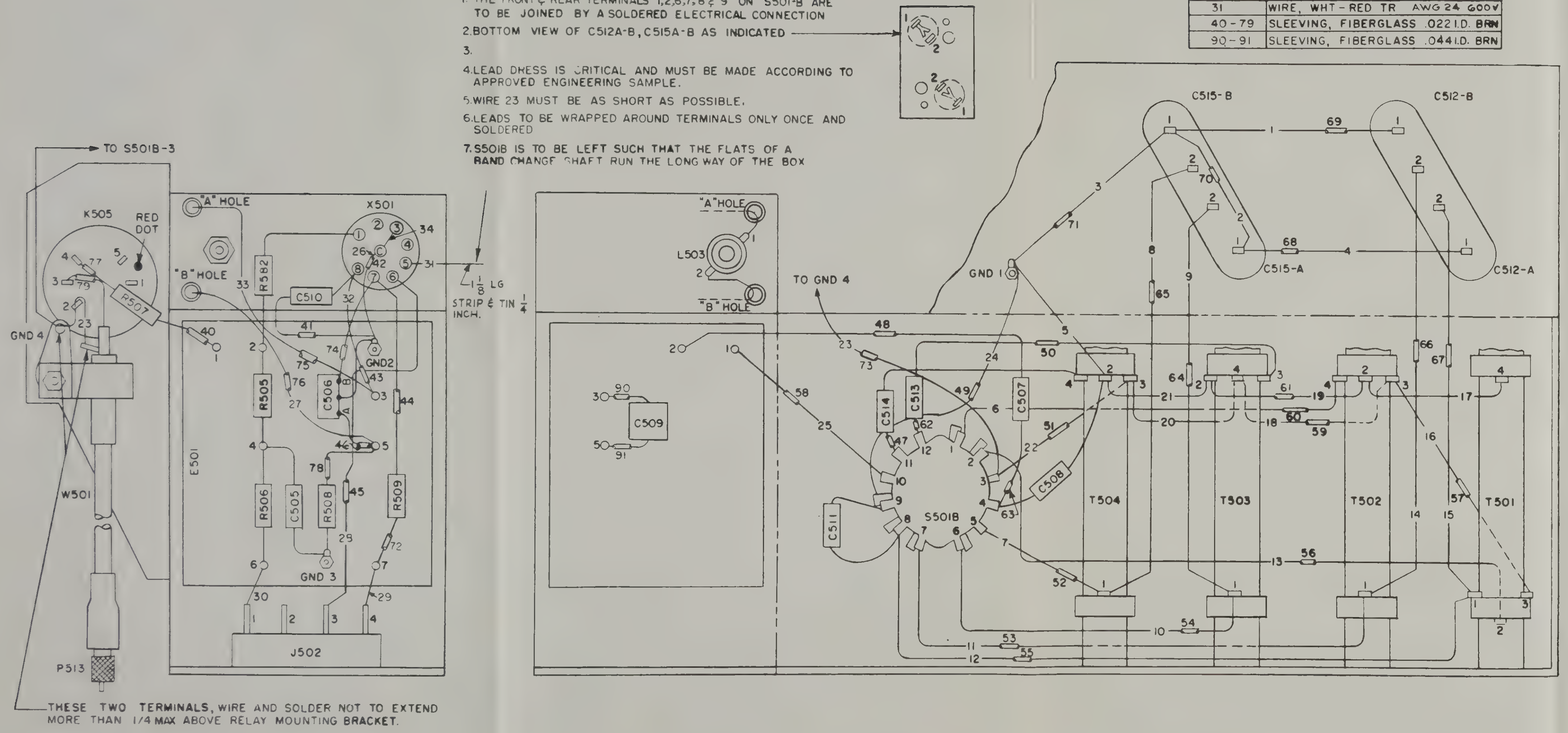

SEE NOTE 2
C523A
C522B
C522A
1
1
2
2
1
64
62
37
38
63
2
3
81
40
2
3
T505
41
4
42
43
78
79
44
80
4
L506
L505
1
1
1
3
2

ler Box, Connection Diagram

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 25	WIRE, TINNED COPPER .0254 DIA
26-30, 32-34	WIRE, TINNED COPPER .0159
31	WIRE, WHT - RED TR AWG 24 600V
40 - 79	SLEEVING, FIBERGLASS .022 I.D. BRN
90 - 91	SLEEVING, FIBERGLASS .044 I.D. BRN

NOTES.

1. THE FRONT & REAR TERMINALS 1,2,6,7,8 & 9 ON S501-B ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION
2. BOTTOM VIEW OF C512A-B, C515A-B AS INDICATED
3.
4. LEAD DRESS IS CRITICAL AND MUST BE MADE ACCORDING TO APPROVED ENGINEERING SAMPLE.
5. WIRE 23 MUST BE AS SHORT AS POSSIBLE.
6. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
7. S501B IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX

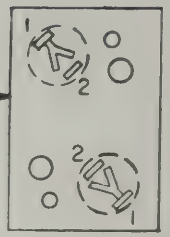

TO S501B-3
K505
RED DOT
GND 4
W501
P513
"A" HOLE
"B" HOLE
X501
R582
C510
R505
C506
GND2
E501
R506
C505
R508
R509
GND 3
J502
1 1/8 LG
STRIP & TIN 1/4 INCH.
"A" HOLE
L503
"B" HOLE
C509
TO GND 4
GND 1
C515-B
C512-B
C515-A
C512-A
C514
C513
C507
C508
C511
S501B
T504
T503
T502
T501

THESE TWO TERMINALS, WIRE AND SOLDER NOT TO EXTEND MORE THAN 1/4 MAX ABOVE RELAY MOUNTING BRACKET.

Figure 11-15. Antenna Amplifier Box, Connection Diagram

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1,3-7	WIRE, TINNED COPPER .0159 DIA
20-44	WIRE, TINNED COPPER .0254 DIA
55-83	SLEEVING, FIBERGLASS BRN .022 ID
2	WIRE, WHT-RED TR. AWG 24 600V

2. BOTTOM VIEW OF C522A, B AND C523A, B AS SHOWN
3. THE FRONT AND REAR TERMINALS 1, 2, 6, 7, 8, 9 AND 12 ON S501C ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
4. LEAD DRESS IS CRITICAL
5. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED USING ITEM 44.
6. S501C IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX.
7. STRIP AND TIN 1/4 INCH.



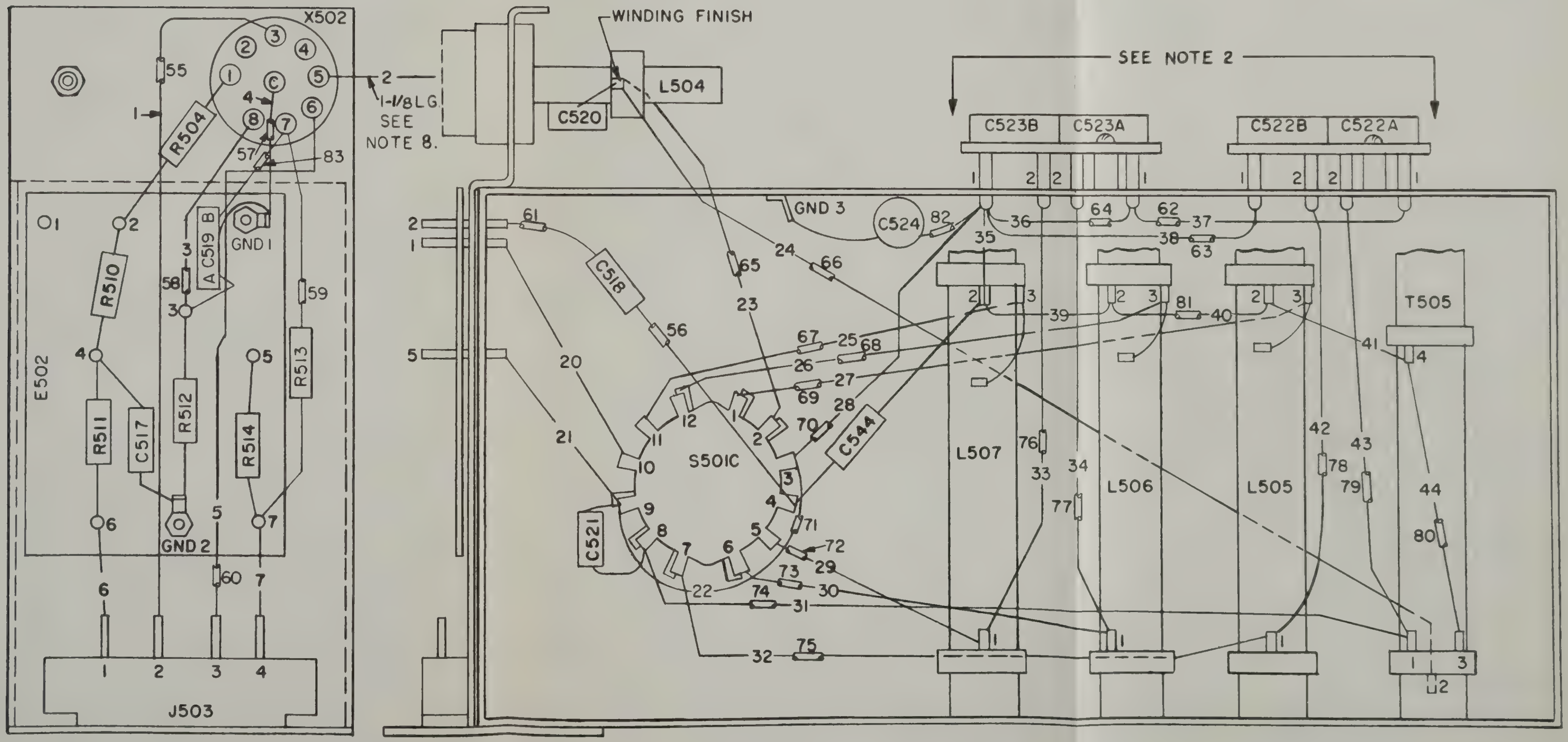
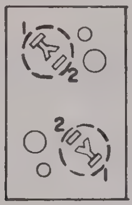

X502
55
1
R504
4
57
83
2
1-1/8 LG SEE NOTE 8.
WINDING FINISH
C520
L504
SEE NOTE 2
C523B
C523A
C522B
C522A
E502
O1
2
R510
3
58
A C519 B
GND 1
59
R513
4
5
R511
C517
R512
R514
6
GND 2
5
60
7
6
7
1
2
3
4
J503
2
1
5
61
C518
56
20
21
GND 3
C524
82
36
64
62
37
35
38
63
24
66
65
23
39
81
40
41
T505
67
25
68
26
27
69
28
70
C544
S501C
12
11
10
9
8
7
6
5
4
3
2
1
C521
71
72
29
73
30
74
31
22
32
75
L507
76
33
34
77
L506
42
78
43
79
L505
44
80
1
2
3

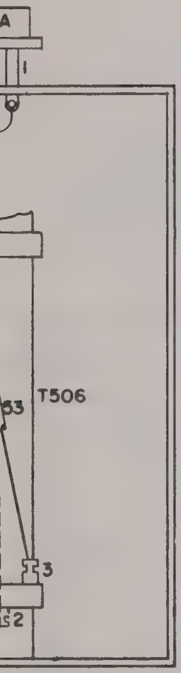
Figure 11-16. R.F. Amplifier Box, Connection Diagram

NOTES:

1. THE FRONT AND REAR TERMINALS 1,2,6,7,8,9 AND 12 ON S501D ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
2. BOTTOM VIEW OF C531A & B, C530A & B AS INDICATED.



3. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
4. LEAD DRESS IS CRITICAL
5. S501D IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX.
6. E503-5 WILL HAVE A MINIMUM OF SOLDER AND NO INSPECTION DOT.
7. LEAD AND SLEEVING 47 WILL BE DRESSED AWAY FROM E501-1.



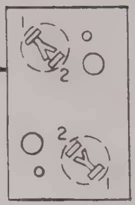
WIRE TABLE	
WIRE NO	DESCRIPTION
	COLOR AND CONDUCTOR
1 - 24	WIRE, TINNED COPPER .0254 DIA
25 - 32	WIRE, TINNED COPPER .0159 DIA
40 - 72	SLEEVING .022 ID BRN

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 23	WIRE, TINNED COPPER .0254 DIA
30 - 41	WIRE, TINNED COPPER .0159 DIA.
42	WIRE, WHT-RED TR. AWG 24 600 V
50 - 89	SLEEVING, BRN. .022 I.D.

LATS OF A BAND
THE BOX.

NOTES:

1. THE FRONT AND REAR TERMINALS 1,2,5,6,7,8,11 AND 12 ON S501E ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION
2. BOTTOM VIEW OF C540A-B AND C541A-B AS SHOWN.
3. LEAD DRESS IS CRITICAL
4. LEAD TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
5. LEAD AND SLEEVING 84 WILL BE DRESSED AWAY FROM E504-1.



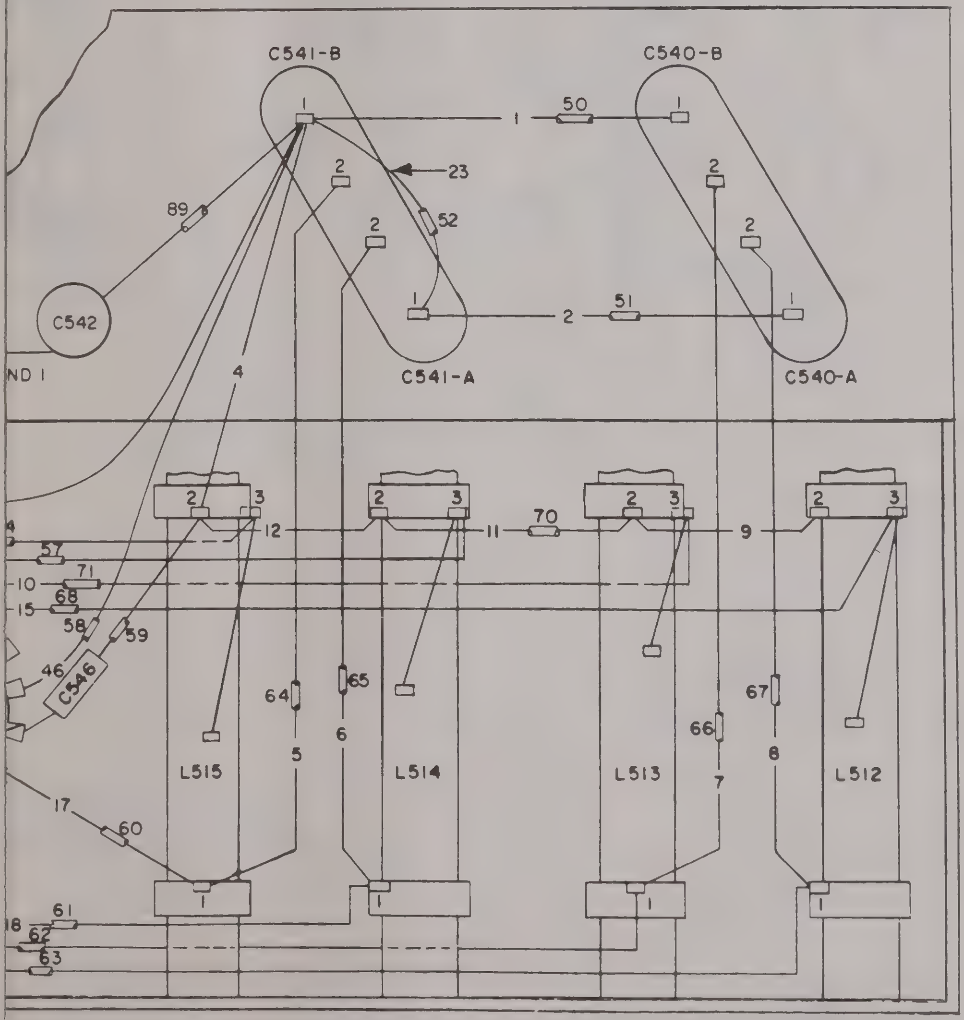

C541-B
C540-B
1
50
1
1
2
23
2
89
2
52
2
2
1
2
51
1
C542
ND 1
4
C541-A
C540-A
2
3
12
2
3
11
70
2
3
9
2
3
4
57
71
10
68
15
58
59
46
C546
64
65
6
5
67
66
8
7
L515
L514
L513
L512
17
60
1
1
1
1
61
18
62
63

Figure 11-18. Doubler-Reactor Box, Connection Diagram

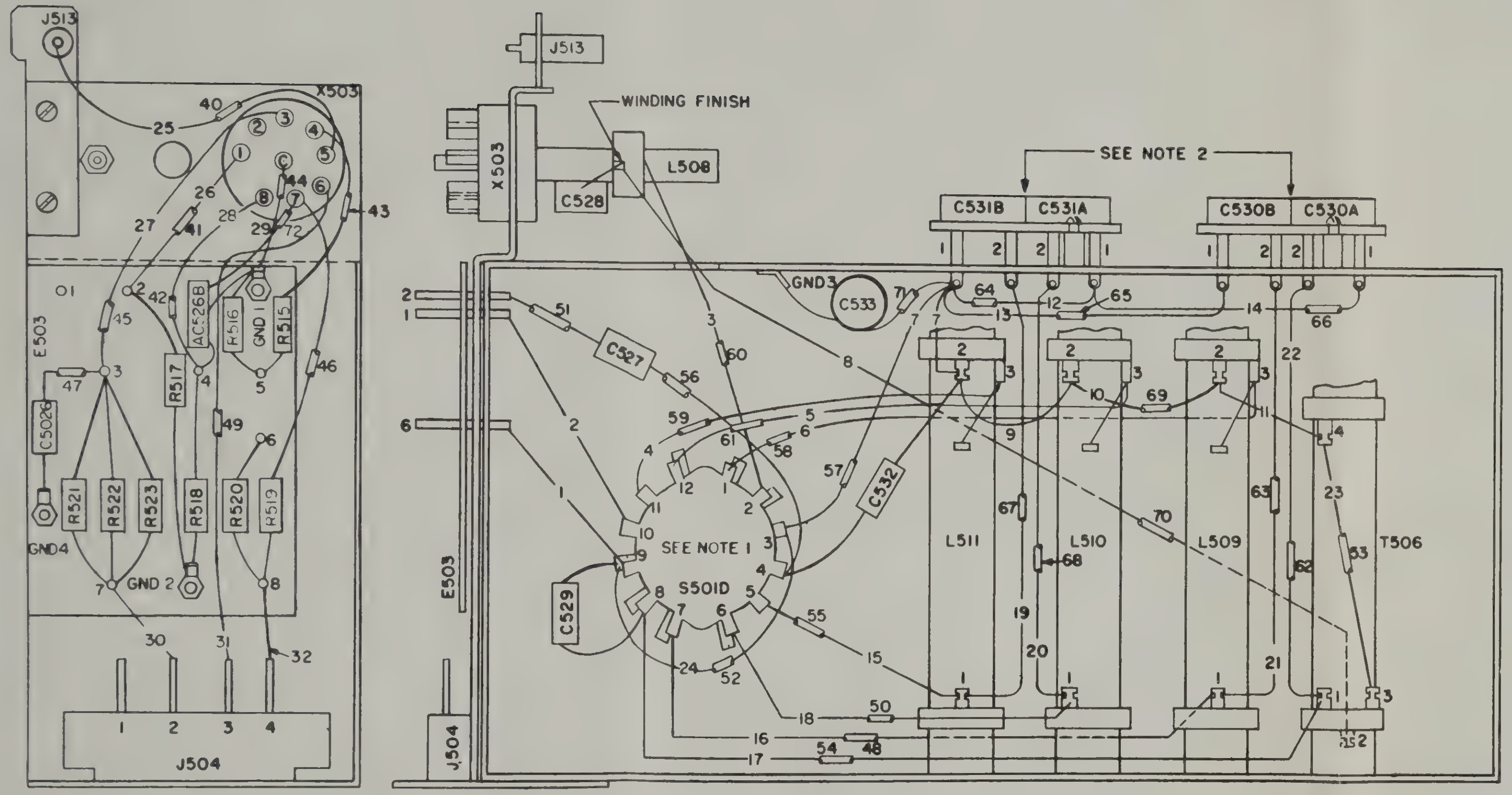
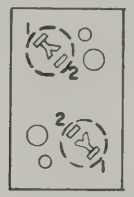

J513
X503
J513
X503
WINDING FINISH
L508
C528
SEE NOTE 2
C531B
C531A
C530B
C530A
GND3
C533
C527
C532
C529
C5026
R521
R522
R523
R518
R520
R519
R517
AC526B
R516
GND 1
R515
E503
GND4
GND 2
J504
J504
E503
SEE NOTE 1
S501D
L511
L510
L509
T506

Figure 11-17. Mixer Box, Connection Diagram

NOTES:

1. THE FRONT AND REAR TERMINALS 1,2,6,7,8,9 AND 12 ON S501D ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
2. BOTTOM VIEW OF C531A & B, C530A & B AS INDICATED.



3. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
4. LEAD DRESS IS CRITICAL
5. S501D IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX.
6. E503-5 WILL HAVE A MINIMUM OF SOLDER AND NO INSPECTION DOT.
7. LEAD AND SLEEVING 47 WILL BE DRESSED AWAY FROM E501-1.

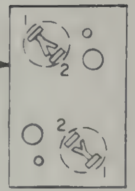
WIRE TABLE

WIRE NO	DESCRIPTION
	COLOR AND CONDUCTOR
1 - 24	WIRE, TINNED COPPER .0254 DIA
25 - 32	WIRE, TINNED COPPER .0159 DIA
40 - 72	SLEEVING .022 ID BRN

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 23	WIRE, TINNED COPPER .0254 DIA
30 - 41	WIRE, TINNED COPPER .0159 DIA.
42	WIRE, WHT-RED TR. AWG 24 600V
50 - 89	SLEEVING, BRN. .022 I.D.

NOTES:

1. THE FRONT AND REAR TERMINALS 1,2,5,6,7,8,11 AND 12 ON S501E ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION
2. BOTTOM VIEW OF C540A-B AND C541A-B AS SHOWN.



3. LEAD DRESS IS CRITICAL
4. LEAD TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
5. LEAD AND SLEEVING 84 WILL BE DRESSED AWAY FROM E504-1.
6. S501E IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX.

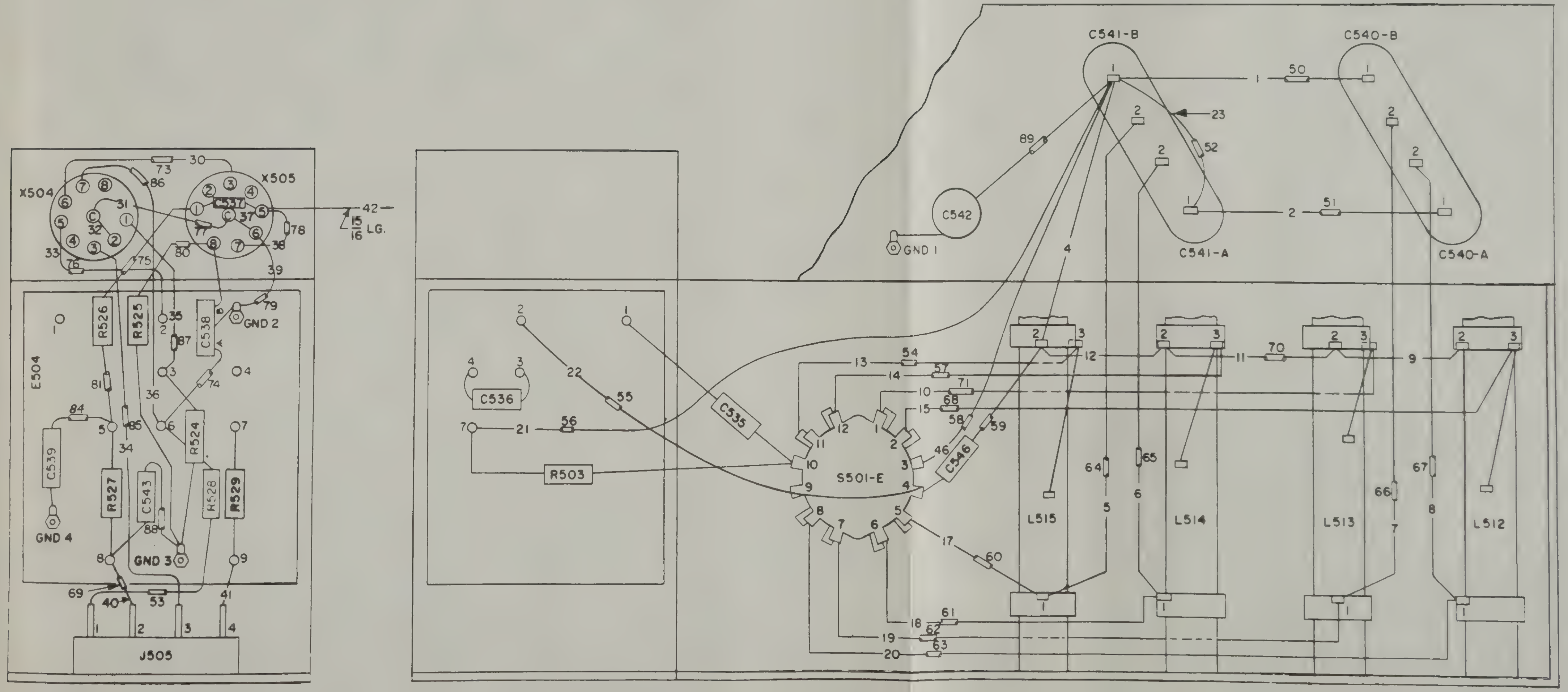
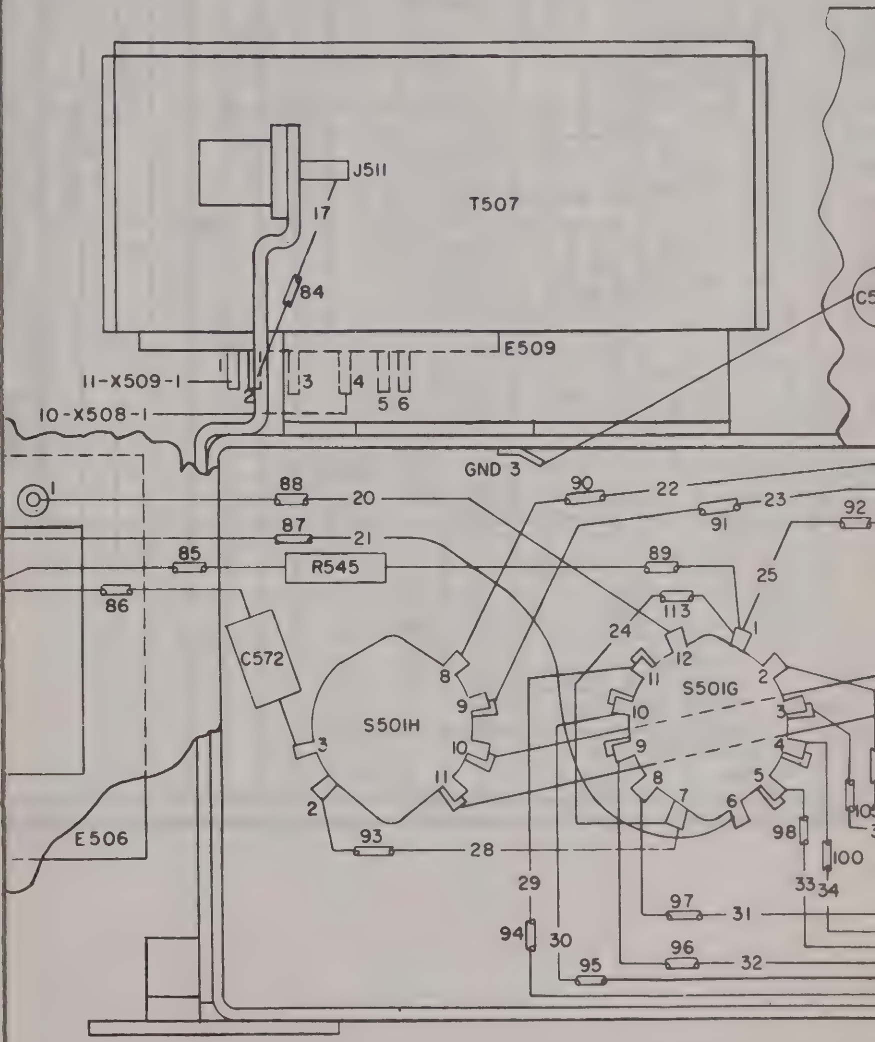

X504
X505
C537
42
15/16 LG.
R526
R525
C538
GND 2
E504
C539
R527
C543
R524
R528
R529
GND 4
GND 3
J505
C536
R503
C535
S501-E
C546
C542
GND 1
C541-B
C541-A
C540-B
C540-A
L515
L514
L513
L512

Figure 11-18. Doubler-Reactor Box, Connection Diagram

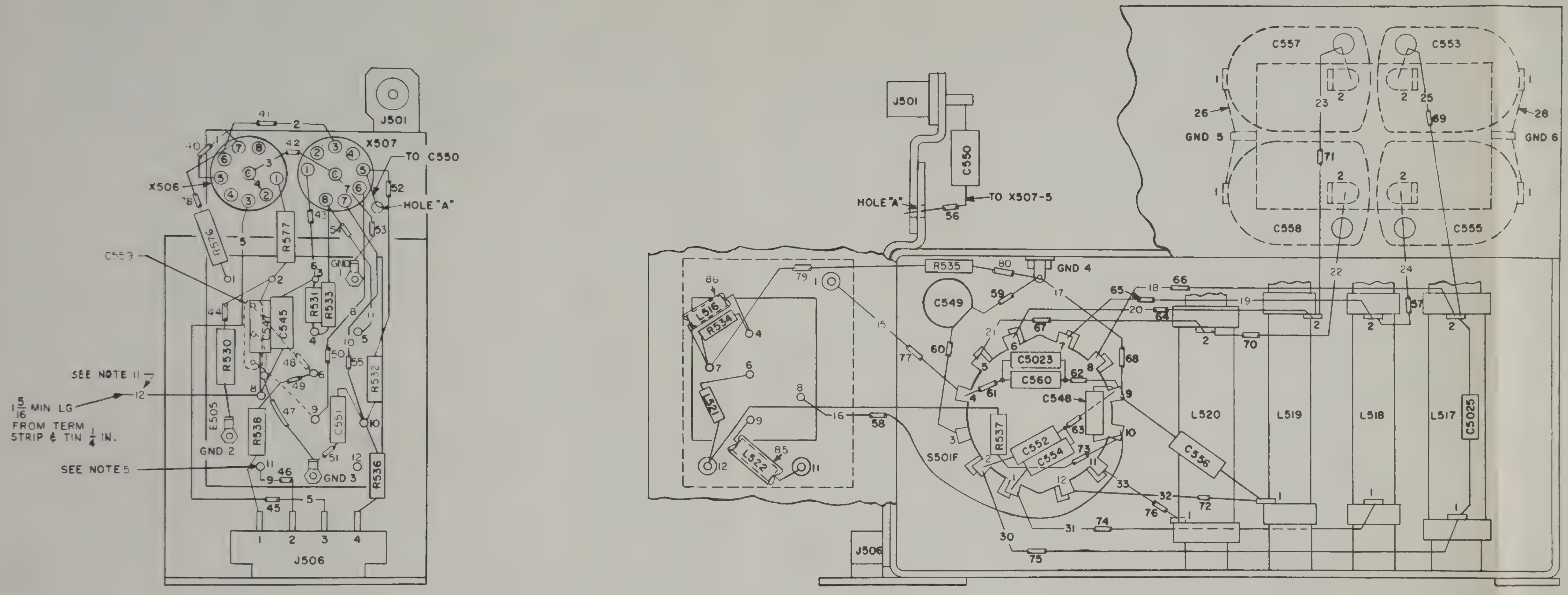
OTES:

1. NUMBERS INSIDE WAFER SWITCH ARE FRONT TERMINALS.
2. THE FRONT AND REAR TERMINALS 3, 4, 5, 9, 10 AND 11 ON S501G AND 9, 10 AND 11 ON S501H ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
3. LEAD DRESS IS CRITICAL
4. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
5. LEADS AND SLEEVING WILL BE DRESSED AWAY FROM E506-3 AND E506-4.
6. E506-3 WILL HAVE A MINIMUM OF SOLDER
7. S501H AND S501G WILL BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
8. C568 TOP IS TO BE WELL DOWN FROM E506-2 AND SLEEVING 71 MUST BE LONG ENOUGH TO PROTECT LEAD FROM E506-2.



J511
T507
17
84
E509
11-X509-1
10-X508-1
1
2
3
4
5 6
GND 3
C5
1
88
20
87
21
85
R545
86
90
22
91
23
92
89
25
113
24
C572
S501H
S501G
8
9
10
11
3
2
12
11
10
9
8
7
6
5
4
3
2
1
93
28
29
94
30
95
96
32
97
31
98
100
33
34
E506

Figure 11-20.


J501
X506
X507
TO C550
HOLE "A"
C559
R576
R577
R531
R533
C547
C545
R530
R532
R538
C551
R536
E505
GND 1
GND 2
GND 3
SEE NOTE 11
1 5/16 MIN LG
FROM TERM STRIP & TIN 1/4 IN.
SEE NOTE 5
J506
C550
TO X507-5
C557
C553
C558
C555
GND 4
GND 5
GND 6
R535
C549
C5023
C560
C548
R537
C552
C554
C556
S501F
L516
R534
L521
L522
L520
L519
L518
L517
C5025
J506

WIRE NO.	DESCRIPTION
	COLOR AND CONDUCTOR
1 - 11	WIRE TINNED COPPER .0159 DIA.
12	WIRE, WHT-RED TR AWG 24 600 V
15 - 33	WIRE, TINNED COPPER .0254 DIA.
40-80	SLEEVING, BRN .022 I.D.
	INSULATOR
85-86	SLEEVING, BRN .186 I.D.

NOTES

1. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
2. ALL SLEEVING WILL BE DRESSED AWAY FROM E505-5.
3. THE FRONT AND REAR TERMINALS 1,2,5,6,7,8, 11 AND 12 ON S501F ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
4. LEAD DRESS IS CRITICAL
5. CUT OFF ALL EXPECT 1/16 INCH OF PIN 12 AFTER SOLDERING WIRE 9.
6. S501F IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE LONG WAY OF THE BOX.
7. X506-5 AND E505-5 TO HAVE A MINIMUM OF SOLDER
8. DRESS WIRE # 12 UNDER R530

Figure 11-19. Oscillator-Buffer Box, Connection Diagram

NOTES:

1. NUMBERS INSIDE WAFER SWITCH ARE FRONT TERMINALS.
2. THE FRONT AND REAR TERMINALS 3,4,5,9,10 AND 11 ON S501G AND 9,10 AND 11 ON S501H ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
3. LEAD DRESS IS CRITICAL
4. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE AND SOLDERED
5. LEADS AND SLEEVING WILL BE DRESSED AWAY FROM E506-3 AND E506-4.
6. E506-3 WILL HAVE A MINIMUM OF SOLDER
7. S501H AND S501G WILL BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
8. C568 TOP IS TO BE WELL DOWN FROM E506-2 AND SLEEVING 71 MUST BE LONG ENOUGH TO PROTECT LEAD FROM E506-2.

WIRE TABLE	
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1 - 17	WIRE TINNED COPPER .015 DIA.
20-47	WIRE TINNED COPPER .025 DIA.
60-116	SLEEVING FIBERGLAS BRN. .022 I.D.

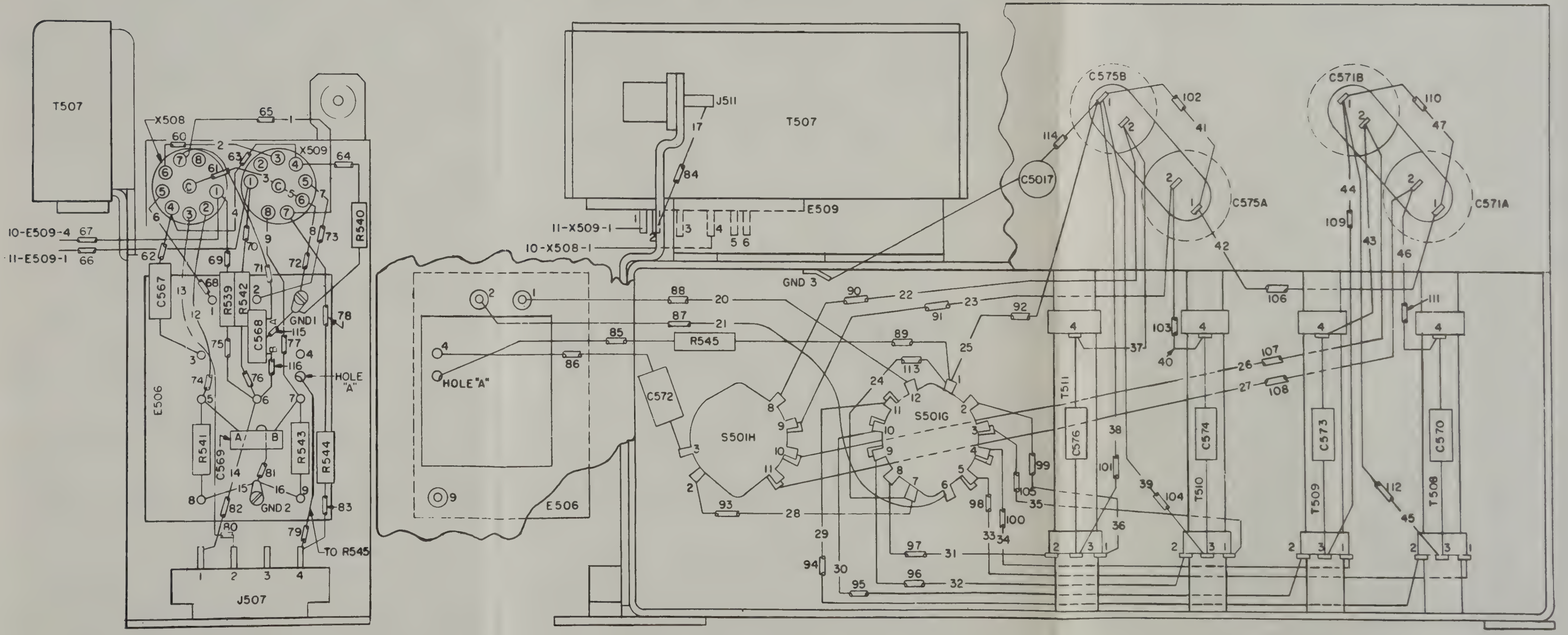
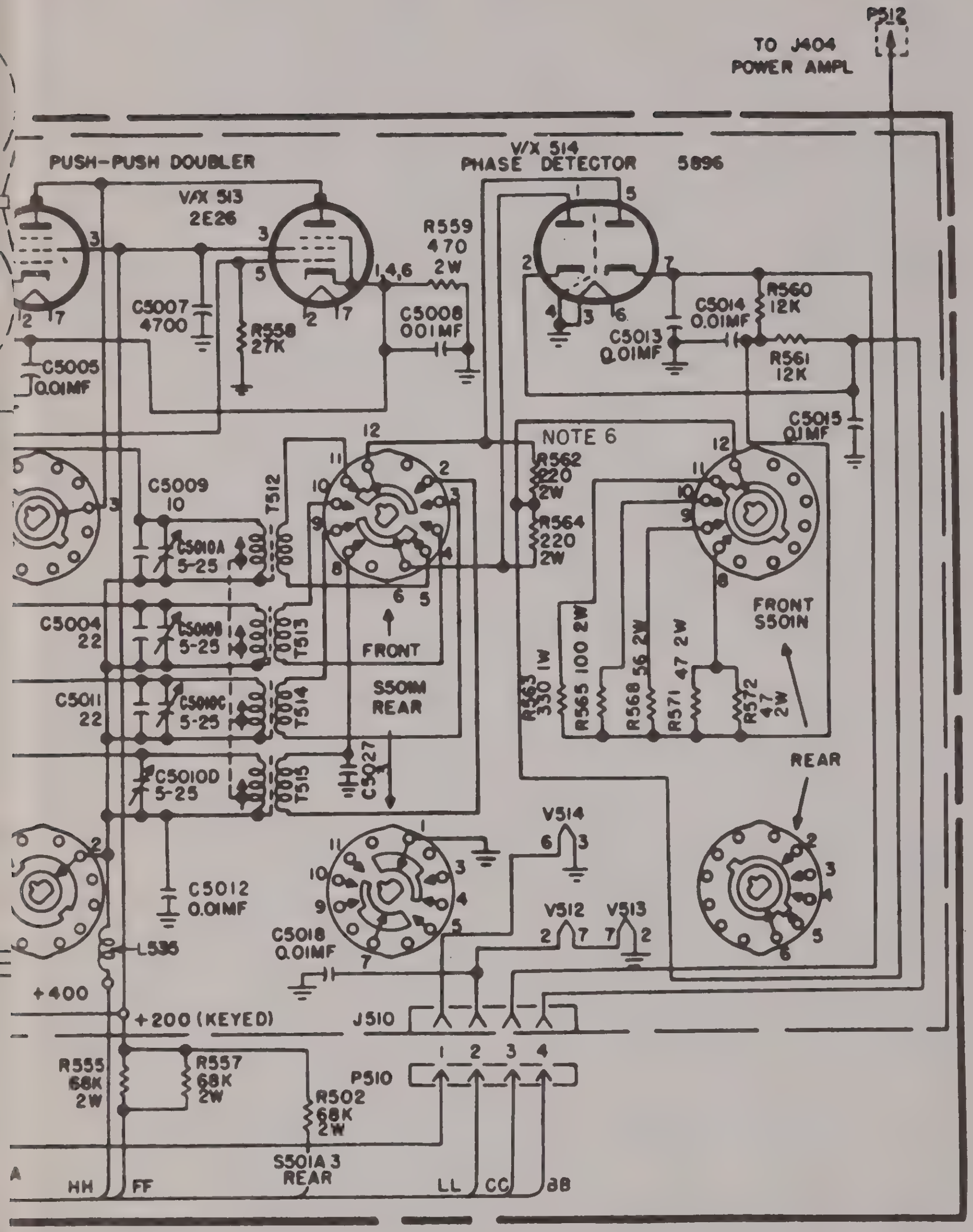

T507
X508
X509
10-E509-4
11-E509-1
C567
R539
R542
C568
R540
GND 1
HOLE "A"
E506
R541
C569
R543
R544
GND 2
TO R545
J507
J511
E509
11-X509-1
10-X508-1
GND 3
R545
C572
S501H
S501G
C5017
C575B
C575A
C571B
C571A
T511
C576
T510
C574
T509
C573
T508
C570

Figure 11-20. Balanced Modulator Box, Connection Diagram

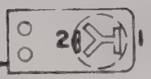

P512
TO J404
POWER AMPL
PUSH-PUSH DOUBLER
V/X 513
2E26
V/X 514
PHASE DETECTOR
5896
R559
470
2W
C5007
4700
R558
27K
C5008
.001MF
C5005
0.01MF
C5014
0.01MF
C5013
0.01MF
R560
12K
R561
12K
C5015
.01MF
NOTE 6
R562
220
2W
R564
220
2W
C5009
10
C5010A
5-25
T512
C5004
22
C5010B
5-25
T513
C5011
22
C5010C
5-25
T514
C5010D
5-25
T515
C5027
FRONT
S501M
REAR
FRONT
S501N
REAR
R563
330 1W
R565 100 2W
R568 56 2W
R571 47 2W
R572
47
2W
V514
V512
V513
C5012
0.01MF
C5018
0.01MF
L536
+400
+200 (KEYED)
J510
P510
R555
68K
2W
R557
68K
2W
R502
68K
2W
S501A 3
REAR
A
HH
FF
LL
CC
BB

D-C RESISTANCE OF COIL WINDINGS IN OHMS

Circuit Symbol	*Coil Terminals*	*Ohms*
K501	1-5	5000
K502	1-5	5000
K503	1-5	500
K504	1-10	365
K505	1-5	500
O501	Clutch	20

SOLDER AND NO INSPECTION DOT.

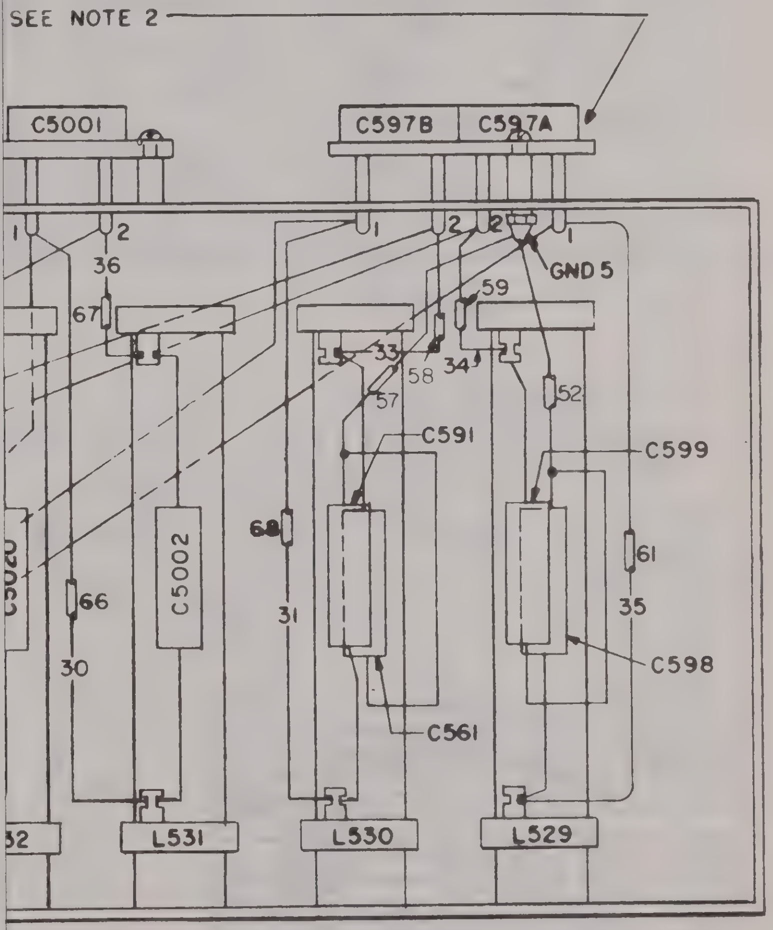
, C5001, C597A, C597B AS SHOWN



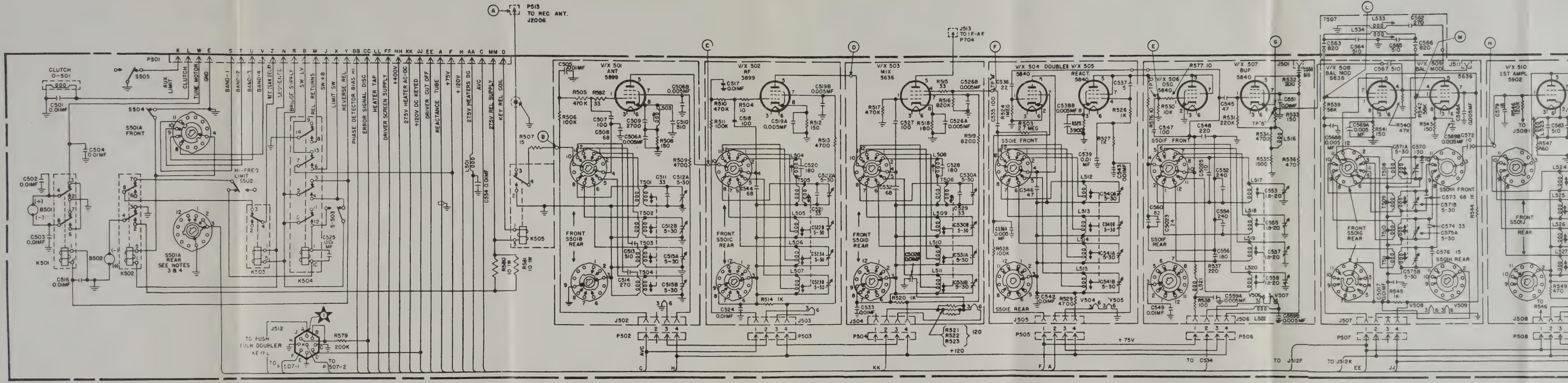
FRONT AND REAR TERMINALS 1,2,5
INED BY A SOLDERED ELECTRICAL

D TERMINALS ONLY ONCE, AND SOLDERED

THE FLATS OF A BAND CHANGE SHAFT
.


SEE NOTE 2
C5001
C597B
C597A
1
2
36
67
1
2
2
1
GND 5
59
33
58
34
52
57
C591
C599
68
66
C5002
C5020
31
61
35
C598
30
C561
32
L531
L530
L529

Amplifier Box, Connection Diagram


P513
TO REC ANT.
J2006
P501
CLUTCH
O-501
S505
AUX LIMIT
CLUTCH
TUNE MOTOR
GND
BAND-1
BAND-2
BAND-3
BAND-4
MEGACYCLE RELAY
SEQUENCE
BRIDGE SUPPLY
SW LV
REL. RETURNS
SW +B
LIMIT SW
REVERSE REL
PHASE DETECTOR BIAS HI
ERROR SIGNAL DISC
HEATER TAP
DRIVER SCREEN SUPPLY
+400V
275V HEATER AC-DC
+120V DC KEYED
DRIVER CUT OFF
REACTANCE TUBE
+75V
+120V
275V HEATERS DC
AVC
275V REL SUPPLY
KEY REL COIL
S501A FRONT
S501A REAR SEE NOTES 3 & 4
HI-FREQ LIMIT S502
B501
B502
K501
K502
K503
K504
K505
J512
TO FUSH PUSH DOUBLER KEY/FL
R579 200K
V/X 501 ANT 5899
V/X 502 RF 5899
V/X 503 MIX 5636
V/X 504 DOUBLER 5840
V/X 505 REACT. 5840
V/X 506 OSC 5840
V/X 507 BUF 5840
V/X 508 BAL MOD 5636
V/X 509 BAL MOD 5636
V/X 510 1ST AMPL 5902
J513 TO IF-AF P704
FRONT S501B REAR
FRONT S501C REAR
FRONT S501D REAR
S501E FRONT
S501E REAR
S501F FRONT
S501F REAR
FRONT S501G REAR
S501H FRONT
S501H REAR
FRONT S501J REAR
J502
J503
J504
J505
J506
J507
J508
P502
P503
P504
P505
P506
P507
P508
+75V
+120
TO C534
TO J512F
TO J512K

NOTE 1
ALL CAPACITANCE VALUES IN MMF UNLESS OTHERWISE SHOWN.

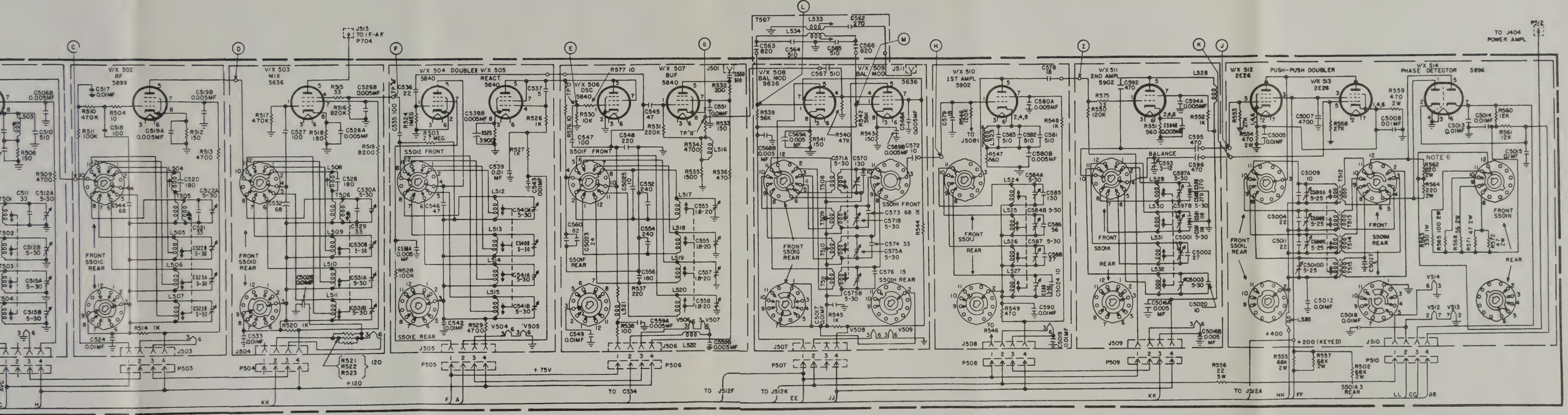
NOTE 2
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

NOTE 3
IN ASSEMBLY S501 "A" TO "N" WAFERS MARKED REAR ARE ADJACENT TO DRIVE END.

NOTE 4
S501 "A" TO "N" SHOWN IN 2 TO 5 M/C BAND & ROTATIO
IS CLOCKWISE VIEWED FROM DRIVE END.

NOTE 5
S501 "B" TO "M" INCL TERMINALS WITH CORRESPONDI
NUMBERS ON FRONT & REAR ARE ELECTRICALLY CONNECTED.

Figure 11-21. Amplifier-Oscillator AM-776A/ARC-21, Schematic Diagram


C
D
J513 TO IF-AF P704
F
E
G
L
M
H
I
K
J
TO J404 POWER AMPL
P512
V/X 502 RF 5899
V/X 503 MIX 5636
V/X 504 DOUBLER 5840
V/X 505 REACT. 5840
V/X 506 OSC 5840
V/X 507 BUF 5840
V/X 508 BAL MOD 5636
V/X 509 BAL MOD 5636
T507
V/X 510 1ST AMPL 5902
V/X 511 2ND AMPL 5902
V/X 512 2E26
PUSH-PUSH DOUBLER
V/X 513 2E26
V/X 514 PHASE DETECTOR 5896
FRONT S501C REAR
FRONT S501D REAR
S501E FRONT
S501E REAR
S501F FRONT
S501F REAR
FRONT S501G REAR
S501H FRONT
S501H REAR
FRONT S501J REAR
FRONT S501K REAR
FRONT S501L REAR
S501M FRONT
S501M REAR
FRONT S501N
REAR
BALANCE
NOTE 6
J503
P503
J504
P504
J505
P505
J506
P506
J507
P507
J508
P508
J509
P509
J510
P510
+75V
+120
+400
+200 (KEYED)
TO C534
TO J512F
TO J512K
TO J512A
KK
F
A
EE
JJ
HH
FF
LL
CC
BB
H
S501A 3 REAR

NOTE 1
ALL CAPACITANCE VALUES IN MMF UNLESS OTHERWISE SHOWN.

NOTE 2
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

NOTE 3
IN ASSEMBLY S501 "A" TO "N" WAFERS MARKED REAR ARE ADJACENT TO DRIVE END.

NOTE 4
S501 "A" TO "N" SHOWN IN 2 TO 5 M/C BAND & ROTATION IS CLOCKWISE VIEWED FROM DRIVE END.

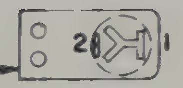
NOTE 5
S501 "B" TO "M" INCL TERMINALS WITH CORRESPONDING NUMBERS ON FRONT & REAR ARE ELECTRICALLY CONNECTED.

NOTE 6
RESISTORS R562 AND R564 MAY EACH BE REPLACED BY THREE 680 OHM, 1W RESISTORS IN PARALLEL.
CUT-IN POINT FOR THIS CHANGE IS NOT AVAILABLE.

D-C RESISTANCE OF COIL WINDINGS IN OHMS

Circuit Symbol	*Coil Terminals*	*Ohms*
K501	1-5	5000
K502	1-5	5000
K503	1-5	500
K504	1-10	365
K505	1-5	500
O501	Clutch	20

NOTES:
1. E508-1 WILL HAVE A MINIMUM OF SOLDER AND NO INSPECTION DOT.
2. BOTTOM VIEW OF C593, C5003, C5001, C597A, C597B AS SHOWN



3. ON WAFER SWITCH (S501K) THE FRONT AND REAR TERMINALS 1, 2, 5, 6, 7, 8, 11 AND 12 ARE TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
4. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE, AND SOLDERED
5. S501K IS TO BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.

WIRE TABLE	
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR
1 - 7	WIRE, TINNED COPPER .015 DIA.
20 - 37	WIRE, TINNED COPPER .0253 DIA.
45 - 81	SLEEVING, FIBERGLAS - BRN .022 I.D.
85	SLEEVING, BRN .512 I.D.

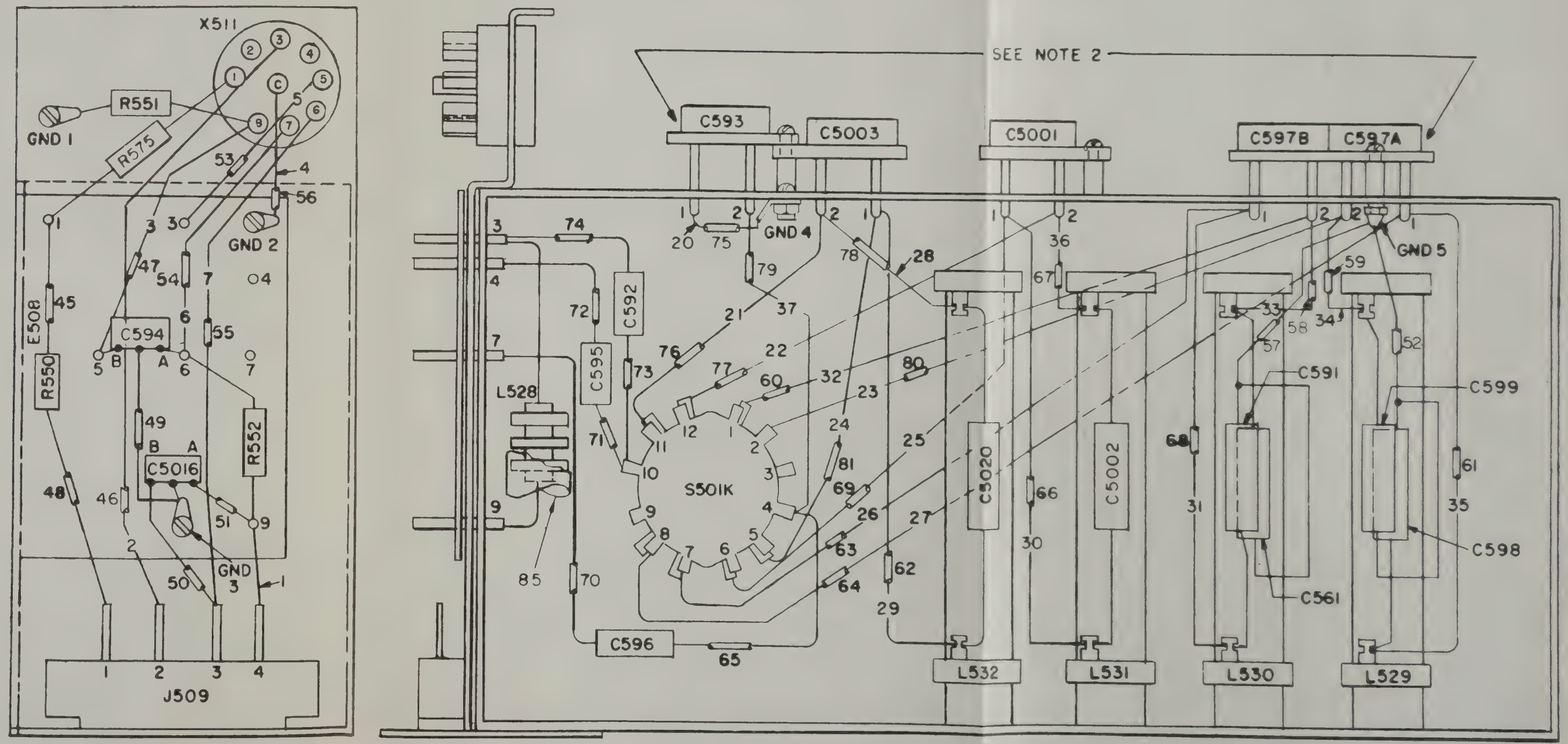
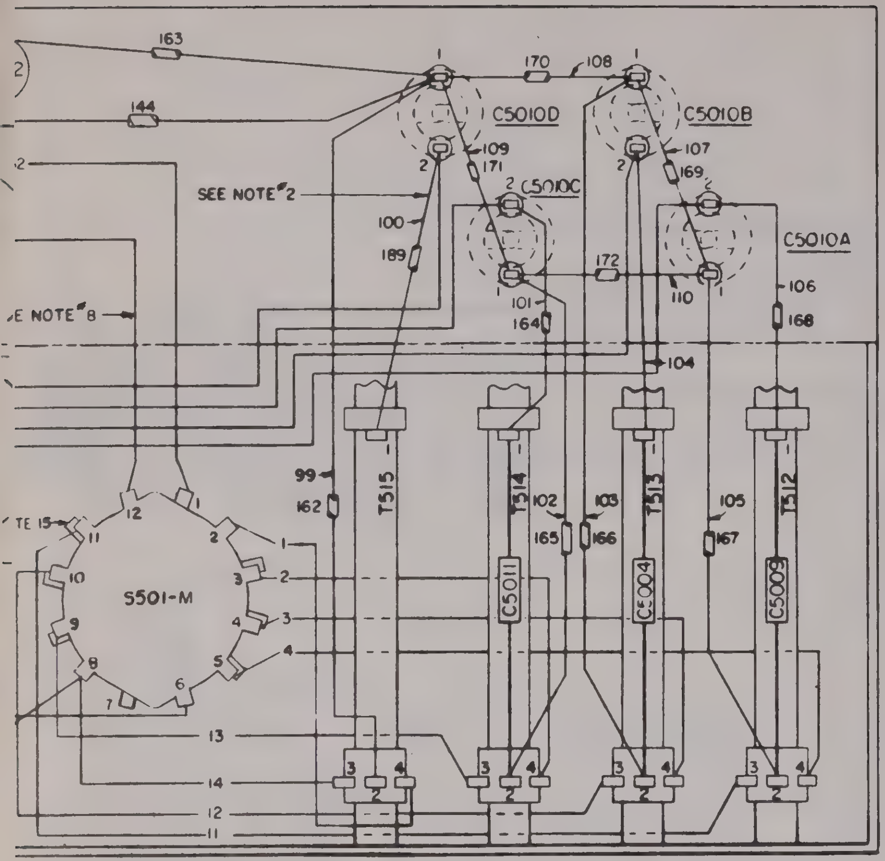

X511
R551
GND 1
R575
53
4
56
GND 2
E508
45
47
54
7
6
55
C594
5 B A 6
7
R550
R552
49
B A
C5016
48
46
51
9
2
50
GND 3
1
1 2 3 4
J509
SEE NOTE 2
C593
C5003
C5001
C597B
C597A
3
74
4
7
9
L528
85
70
72
C592
C595
73
71
20
75
GND 4
79
78
28
21
37
22
76
77
60
32
80
23
24
81
69
25
26
27
63
64
62
29
S501K
C596
65
36
67
C5020
66
30
C5002
68
31
33
58
34
59
57
GND 5
C591
C561
52
C599
61
35
C598
L532
L531
L530
L529

Figure 11-22. Second Amplifier Box, Connection Diagram


163
144
170
108
C5010D
C5010B
109
171
107
169
C5010C
C5010A
SEE NOTE #2
100
189
172
101
164
110
106
168
E NOTE #8
104
99
162
T515
T514
T513
T512
102
103
105
165
166
167
C5011
C5004
C5009
S501-M
TE 15
1
2
3
4
5
6
7
8
9
10
11
12
13
14
13
14
12
11

OTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS.
2. LEAD 100 MUST BE $1 + \frac{1}{15}$" LONG, TERMINAL TO TERMINAL.
3. SWITCH WAFERS S501-L, S501-N, & S501-M ARE VIEWED FROM OPEN SIDE OF BOX. FRONT TERMINALS NUMBERED INSIDE WAFER OUTLINE.
4. LEAD DRESS IS CRITICAL.
5. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE.
6. SOLDER LEAD OF P512 TO E512-6 AND SLIDE SLEEVING TO WITHIN 1/4 OF SOLDERED CONNECTION THEN CLAMP P512 IN PLACE.
7. WIRES 4 & 11, 3 & 12, 2 & 13 SHOULD HAVE APPROX. 3 TWISTS PER INCH & THESE THREE PAIRS MUST BE DRESSED AGAINST THE BACK ON THE BOTTOM OF THE BOX AS CLOSE AS POSSIBLE.
8. WIRES 91 & 119 MUST HAVE A TOTAL OF 2 TWISTS.
9. DETAIL VIEW SHOWS MOUNTING OF THREE RESISTORS IN PARALLEL FOR R562 AND R564.
10. WIRES 1 & 14 ARE TO BE IDENTICAL IN LENGTH, BE TWISTED THREE OR FOUR TIMES AN SHALL BE DRESSED TO BOTTOM OF BOX AND DIRECTLY AWAY FROM T515 TOWARD OPEN SIDE OF BOX.
11. DRESS L535 WELL AWAY FROM E512-8.
12. S501-L, M & N SHALL BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
13. TIE LEAD 5 TO SPACER COVERED WITH SLEEVING, USING TWO TURNS OF NYLON CORD. TIE TO BE WITHIN 3/8 OF TUBE MOUNTING PLATE.
14. ON WAFER SWITCH (S501-L) THE FRONT AND REAR TERMINALS 9, 10 & 11 ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
15. ON WAFER SWITCH (S501-M) THE FRONT AND REAR TERMINALS 3, 4, 5, 9, 10 & 11 ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
16. R562 AND R564 TO BE MATCHED IN RESISTANCE TO WITHIN 1% OF EACH OTHER AFTER SOLDERING.
17. R560 AND R561 TO BE MATCHED IN RESISTANCE TO WITHIN 5% OF EACH OTHER AFTER SOLDERING.

SECTION XII

MAINTENANCE INSTRUCTIONS FOR SELECTOR CONTROL SUBASSEMBLY MX-1425B/ARC-21

12-1. TROUBLE ANALYSIS.

12-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

12-3. A defective unit should be examined carefully for loose or broken parts and dirty or corroded switch contacts. Clean switch contacts with a small brush and carbon tetrachloride.

WARNING

> Use carbon tetrachloride only with adequate ventilation since the fumes are highly toxic.

12-4. Examine the gearing for broken gear teeth and replace those necessary. Do not replace the three gears in the train driving the "thousands" switches or the gears in the clutch assemblies. Check windings of clutches and relays for correct d-c resistance with Multimeter TS-352/U. Refer to chart on the apron of the schematic diagram, figure 12-3, for correct values. Check the resistance of plug, P601, pins to ground as given in Table LXIII and the voltage value of bridge resistors to ground as given in Table LXIV.

12-5. CIRCUIT ANALYSIS.

12-6. This unit forms the receiving end of the servo system linking the Radio Set Control C-451A/ARC-21 to the Radio Receiver-Transmitter RT-128A/ARC-21. It contains four switch-controlled bridge balancing circuits driven by a common motor through clutches controlled by error detecting relays. These relays respond to changes in the frequency selection portion of the bridge in the Radio Set Control C-451A/ARC-21 unit. The operation of the switches in balancing the bridge performs the following functions.

12-7. When any of the bridges are unbalanced, one or more of the relays K601 through K604 are energized thereby energizing the respective clutches (B606 through B609). The ground return circuits of all the clutches are tied together and completed through the coil of relay when any of the clutches are energized.

12-8. Relay K605 now places 27.5 volts on the coil of relay K606. Relay K606, now closed, grounds the return of motor B3605, starting the motor which now drives the clutches. Capacitor C606 and resistor R625, acting as a time-delay circuit, keep relay K606 energized through the transient releases of relay K605 and insure that all clutches reach the home position before the motor stops running. The rotor design on switch S601B front, S602B front, S603B front and S604B front is such that 27.5 volts is constantly applied to the clutch solenoid until the selected position is reached. When all the bridges are balanced, relay K605 is de-energized and the motor B3605 stops.

12-9. Resistor R604 has 22 taps and is mounted on a 24-position switch. To prevent the servo selector from closing down on a blank contact, the front of the switch wafer, S604B, has contacts to close the servo selector circuit so the switch rotor rides past the unused contacts. Similar circumstances in the other three servo selectors are handled in the same way. Wafers C and D of switch S603 supply coding information for selection of the proper plate tuning input capacitor in the power amplifier stage. This information is relevant to the hundreds digit of the frequency setup.

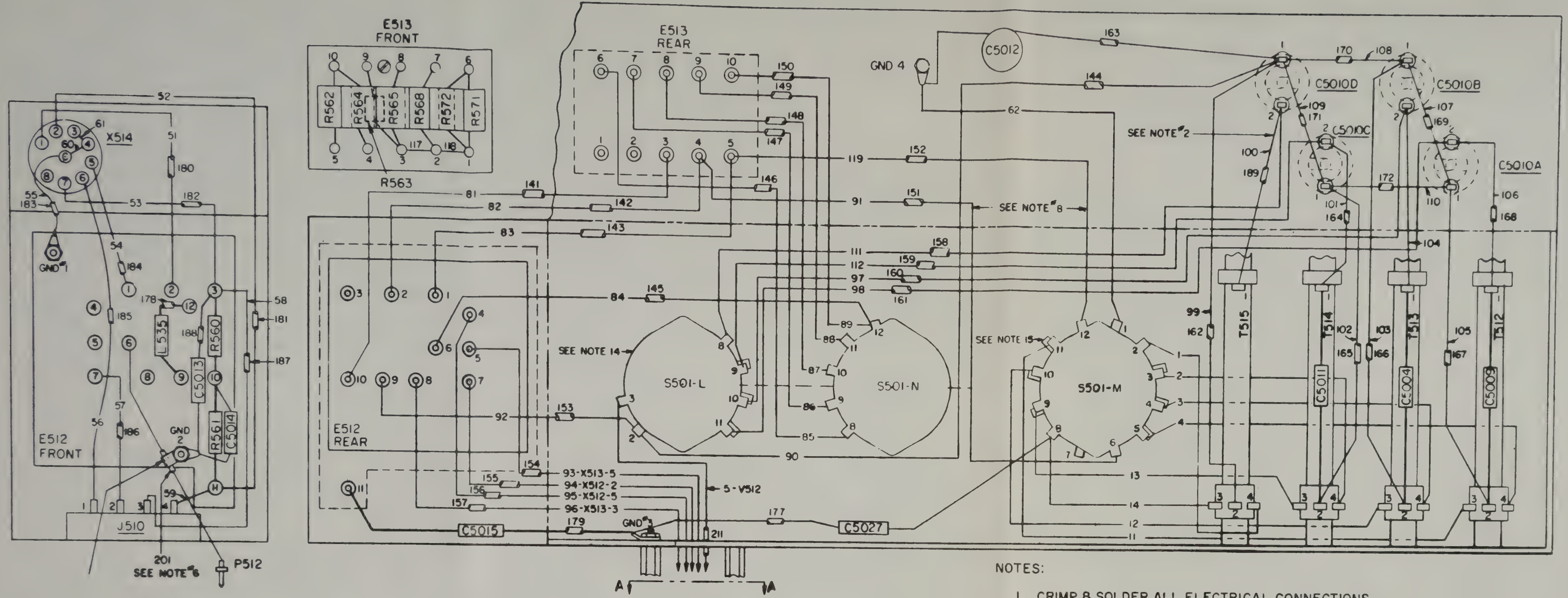
12-10. The rear of wafer S604C supplies coded information to select the correct one of four receiver bands for the operating frequency. The front of the same wafer supplies coded information for the power amplifier input capacitor relating to the thousands digit

TABLE LXIII. RESISTANCE IN OHMS, FROM PLUG P601, PINS TO GROUND

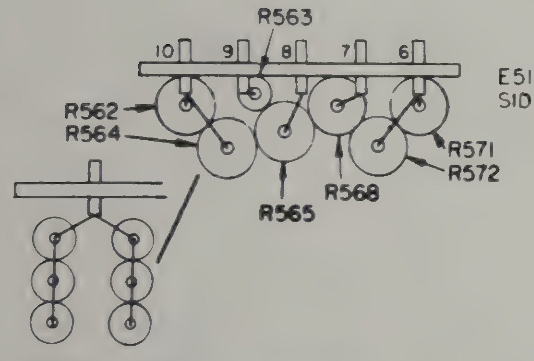
Conditions: Chassis removed from unit. All cables disconnected. Meter negative grounded. Switches set at 2.000 mc.

Pin Reading	A *	B 65k	C 232	D 72	E 34	F *	H 0	J *	K *	L *
Pin Reading	M *	N *	P *	R *	S *	T *	U *	V 0	W *	X *
Pin Reading	Y *	Z *	AA *	BB *	CC 0	DD *	EE *	FF *	HH 72	JJ 6270
Pin Reading	KK 232	LL 0	MM 0	NN 220k						

*Infinite resistance value.

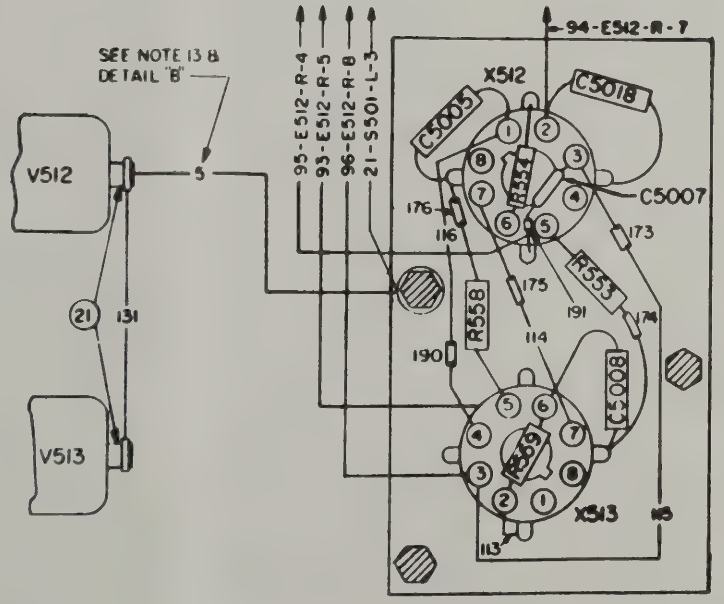

E513 FRONT
E513 REAR
R562
R564
R565
R568
R572
R571
R563
X514
GND 1
L535
R560
C5013
R561
C5014
E512 FRONT
GND 2
J510
201
SEE NOTE 6
P512
E512 REAR
C5015
GND 3
C5027
SEE NOTE 14
S501-L
S501-N
SEE NOTE 15
S501-M
GND 4
C5012
C5010D
C5010B
C5010C
C5010A
SEE NOTE 2
SEE NOTE 8
T515
T514
T513
T512
C5011
C5004
C5009
93-X513-5
94-X512-2
95-X512-5
96-X513-3
5-V512
A
A

NOTES:

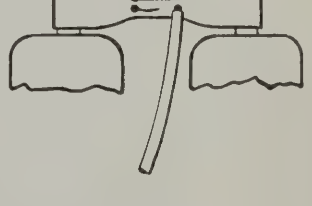

R563
E513 SIDE
R562
R564
R571
R572
R565
R568

SEE NOTE 9

WIRE NOS. INCLUSIVE	DESCRIPTION COLOR AND CONDUCTOR	
1-5	WHT-RED TR.	AWG 24 600 V
11-14	WHT-BLK TR.	AWG 24 600 V
51-62	WIRE TINNED COPPER	.0159 DIA
81-119	WIRE TINNED COPPER	.0253 DIA
131	WIRE TINNED COPPER	.0808 DIA
141-191	SLEEVING SILIC GLASS BRN.	.022 I.D.
201	SLEEVING SILIC GLASS BLK.	.085 I.D.
211	SLEEVING SILIC GLASS BRN	.106 I.D.


SEE NOTE 13 & DETAIL "B"
V512
V513
95-E512-R-4
93-E512-R-5
96-E512-R-8
21-S501-L-3
94-E512-R-7
X512
C5005
C5018
R554
C5007
R558
R553
R559
C5008
X513

VIEW A-A



DETAIL "B"

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS.
2. LEAD 100 MUST BE $1+\frac{1}{15}$" LONG, TERMINAL TO TERMINAL.
3. SWITCH WAFERS S501-L, S501-N, & S501-M ARE VIEWED FROM OPEN SIDE OF BOX. FRONT TERMINALS NUMBERED INSIDE WAFER OUTLINE.
4. LEAD DRESS IS CRITICAL.
5. LEADS TO BE WRAPPED AROUND TERMINALS ONLY ONCE.
6. SOLDER LEAD OF P512 TO E512-6 AND SLIDE SLEEVING TO WITHIN 1/4 OF SOLDERED CONNECTION THEN CLAMP P512 IN PLACE.
7. WIRES 4 & 11, 3 & 12, 2 & 13 SHOULD HAVE APPROX. 3 TWISTS PER INCH & THESE THREE PAIRS MUST BE DRESSED AGAINST THE BACK ON THE BOTTOM OF THE BOX AS CLOSE AS POSSIBLE.
8. WIRES 91 & 119 MUST HAVE A TOTAL OF 2 TWISTS.
9. DETAIL VIEW SHOWS MOUNTING OF THREE RESISTORS IN PARALLEL FOR R562 AND R564.
10. WIRES 1 & 14 ARE TO BE IDENTICAL IN LENGTH, BE TWISTED THREE OR FOUR TIMES AN SHALL BE DRESSED TO BOTTOM OF BOX AND DIRECTLY AWAY FROM T515 TOWARD OPEN SIDE OF BOX.
11. DRESS L535 WELL AWAY FROM E512-8.
12. S501-L, M & N SHALL BE LEFT SUCH THAT THE FLATS OF A BAND CHANGE SHAFT RUN THE SHORT WAY OF THE BOX.
13. TIE LEAD 5 TO SPACER COVERED WITH SLEEVING, USING TWO TURNS OF NYLON CORD. TIE TO BE WITHIN 3/8 OF TUBE MOUNTING PLATE.
14. ON WAFER SWITCH (S501-L) THE FRONT AND REAR TERMINALS 9, 10 & 11 ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
15. ON WAFER SWITCH (S501-M) THE FRONT AND REAR TERMINALS 3, 4, 5, 9, 10 & 11 ARE EACH TO BE JOINED BY A SOLDERED ELECTRICAL CONNECTION.
16. R562 AND R564 TO BE MATCHED IN RESISTANCE TO WITHIN 1% OF EACH OTHER AFTER SOLDERING.
17. R560 AND R561 TO BE MATCHED IN RESISTANCE TO WITHIN 5% OF EACH OTHER AFTER SOLDERING.

Figure 11-23. Doubler Box, Connection Diagram

SECTION XII

MAINTENANCE INSTRUCTIONS FOR SELECTOR CONTROL SUBASSEMBLY MX-1425B/ARC-21

12-1. TROUBLE ANALYSIS.

12-2. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

12-3. A defective unit should be examined carefully for loose or broken parts and dirty or corroded switch contacts. Clean switch contacts with a small brush and carbon tetrachloride.

WARNING

Use carbon tetrachloride only with adequate ventilation since the fumes are highly toxic.

12-4. Examine the gearing for broken gear teeth and replace those necessary. Do not replace the three gears in the train driving the "thousands" switches or the gears in the clutch assemblies. Check windings of clutches and relays for correct d-c resistance with Multimeter TS-352/U. Refer to chart on the apron of the schematic diagram, figure 12-3, for correct values. Check the resistance of plug, P601, pins to ground as given in Table LXIII and the voltage value of bridge resistors to ground as given in Table LXIV.

12-5. CIRCUIT ANALYSIS.

12-6. This unit forms the receiving end of the servo system linking the Radio Set Control C-451A/ARC-21 to the Radio Receiver-Transmitter RT-128A/ARC-21. It contains four switch-controlled bridge balancing circuits driven by a common motor through clutches controlled by error detecting relays. These relays respond to changes in the frequency selection portion of the bridge in the Radio Set Control C-451A/ARC-21 unit. The operation of the switches in balancing the bridge performs the following functions.

12-7. When any of the bridges are unbalanced, one or more of the relays K601 through K604 are energized thereby energizing the respective clutches (B606 through B609). The ground return circuits of all the clutches are tied together and completed through the coil of relay when any of the clutches are energized.

12-8. Relay K605 now places 27.5 volts on the coil of relay K606. Relay K606, now closed, grounds the return of motor B3605, starting the motor which now drives the clutches. Capacitor C606 and resistor R625, acting as a time-delay circuit, keep relay K606 energized through the transient releases of relay K605 and insure that all clutches reach the home position before the motor stops running. The rotor design on switch S601B front, S602B front, S603B front and S604B front is such that 27.5 volts is constantly applied to the clutch solenoid until the selected position is reached. When all the bridges are balanced, relay K605 is de-energized and the motor B3605 stops.

12-9. Resistor R604 has 22 taps and is mounted on a 24-position switch. To prevent the servo selector from closing down on a blank contact, the front of the switch wafer, S604B, has contacts to close the servo selector circuit so the switch rotor rides past the unused contacts. Similar circumstances in the other three servo selectors are handled in the same way. Wafers C and D of switch S603 supply coding information for selection of the proper plate tuning input capacitor in the power amplifier stage. This information is relevant to the hundreds digit of the frequency setup.

12-10. The rear of wafer S604C supplies coded information to select the correct one of four receiver bands for the operating frequency. The front of the same wafer supplies coded information for the power amplifier input capacitor relating to the thousands digit

TABLE LXIII. RESISTANCE IN OHMS, FROM PLUG P601, PINS TO GROUND

Conditions: Chassis removed from unit. All cables disconnected. Meter negative grounded. Switches set at 2.000 mc.

Pin Reading	A *	B 65k	C 232	D 72	E 34	F *	H 0	J *	K *	L *
Pin Reading	M *	N *	P *	R *	S *	T *	U *	V 0	W *	X *
Pin Reading	Y *	Z *	AA *	BB *	CC 0	DD *	EE *	FF *	HH 72	JJ 6270
Pin Reading	KK 232	LL 0	MM 0	NN 220k						

*Infinite resistance value.

TABLE LXIV. VOLTAGE, BRIDGE RESISTORS TO GROUND

Conditions: Input voltage 27.8 volts measured at minor test point AJ (TP-L). Voltage measured with Multimeter TS-352/U.
Switches set at 2.000-megacycle position.

Contact Number	R601	R602	R603	R604
1	-	-	-	-
2	26.8	26.8	26.8	26.8
3	26.8	26.8	26.8	26.8
4	26.5	24	24.5	26.8
5	25.5	21.7	21	24.8
6	24.5	18.5	18.8	23
7	22.5	15.2	15	22.5
8	21.5	11.5	11.5	21
9	20.5	8.15	8.1	19.8
10	19	5	5.1	18.1
11	17.2	2.3	2.3	16.8
12	15.5	0	0	15.5
13	14			13.9
14	12.2			12.5
15	10.9			11
16	9.4			9.6
17	7.8			8.2
18	6.3			6.8
19	4.85			5.5
20	3.6			4.2
21	2.3			3.1
22	1.1			2
23	0			0.95
24	0			0

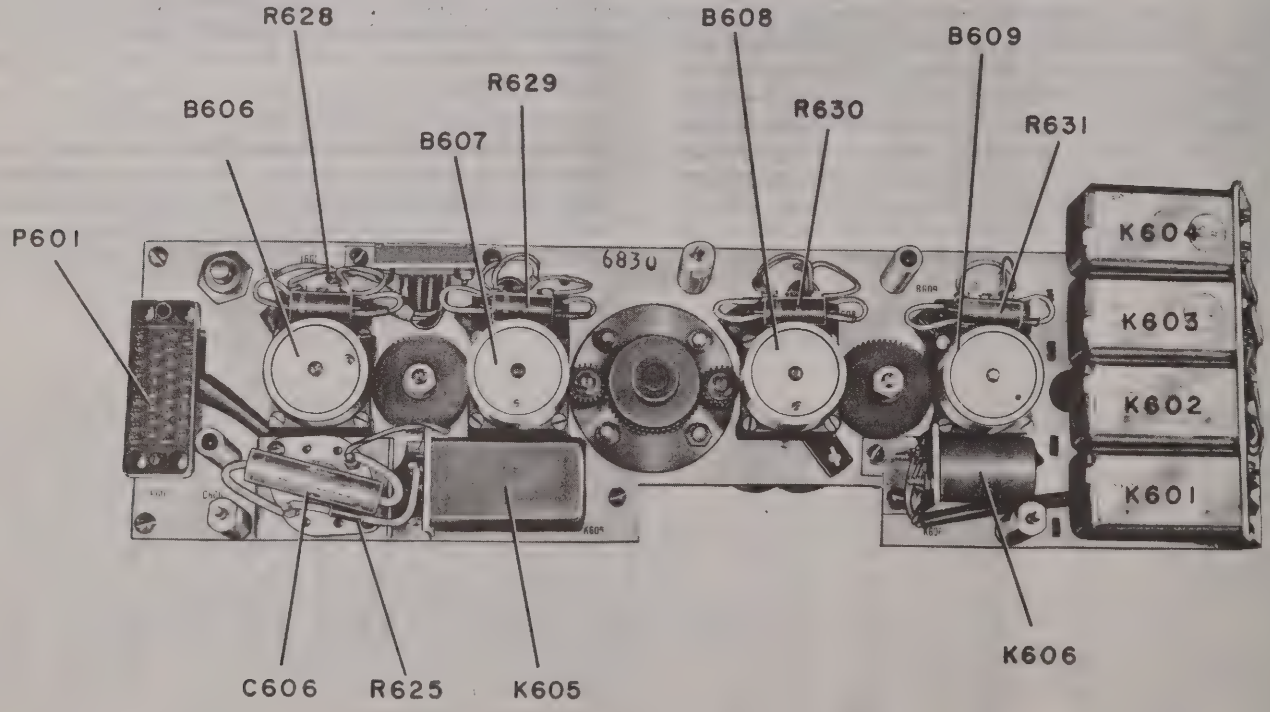

R628
B608
B609
R629
B606
R630
R631
B607
P601
6830
K604
K603
K602
K601
K606
C606
R625
K605

Figure 12-1. Selector Control Subassembly MX-1425B/ARC-21, Top

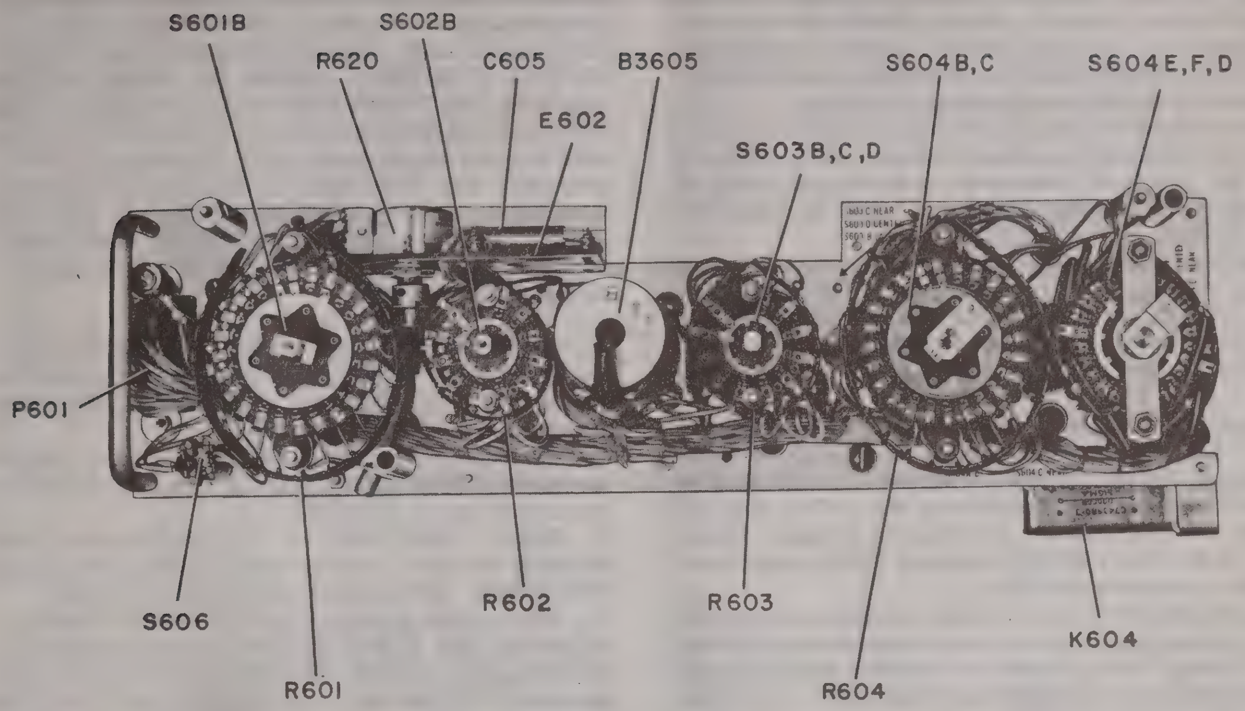


Figure 12-2. Selector Control Subassembly MX-1425B/ARC-21, Bottom

of the operating frequency. The front of switch wafer S604B, in addition to bridging the dead contacts on the resistance ridge, energizes the relay connecting capacitors C439 and C440 across part of the power amplifier plate r-f choke coil.

12-11. Switch wafer S604E rear, controls the phase detector bias as required for the various frequencies. Adjustment is in one-megacycle steps. Switch wafer S604F rear, adjusts the servo amplifier gain to Relay Assembly RE-135B/ARC-21. In addition to the functions described, the servo selectors are mechanically coupled to switches in the Amplifier-Filter Assembly AM-775A/ARC-21 and Oscillator, Radio Frequency O-180A/ARC-21 chassis to select the proper frequencies and bandpass filters for setting up the operating frequency.

12-12. ADJUSTMENT AND CHECKS.

12-13. GENERAL. Paragraphs 12-16 through 12-17 describe procedures for adjusting bridge balance and checking the servo and coding circuits.

12-14. Table LXVI is a maintenance check list summarizing maintenance procedures for this component. It lists procedures, indications and tests that will assure field maintenance personnel that the Selector Assembly MX-1425B/ARC-21 meets minimum standards of performance. Table LXVI may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

12-15. For the following checks, install the Selector Control Subassembly MX-1425B/ARC-21 in Chassis, Receiver-Transmitter MX-1424A/ARC-21 with Oscillator, Radio Frequency O-180A/ARC-21 removed. The bridge balancing switches are then accessible.

12-16. ADJUSTING BRIDGE BALANCE. Before attempting to check the operation of the servo circuits, the bridge voltage must be balanced to match the voltage applied in the Radio Set Control C-451A/ARC-21. Proceed as follows:

CAUTION

> When adjusting bridge supply balancing potentiometer R620 DO NOT use a vacuum tube voltmeter because the case may be returned to ground through the a-c line or an additional ground lead attached to the meter which is connected when the meter is in use. This will result, in some cases, in grounding the 27.5-volt supply through resistor R620, the bridge resistor, the switch contacts, or all three. This will damage bridge resistors, resistor R620 or the switch contacts. Always use a standard, portable 20,000 ohms-per-voltmeter.

a. Turn on radio set. Change "CHANNEL" to a channel setup for 2 mc.

b. Note whether the switches S601B, S603B and S604B have set properly. Each of the switches, except S601B, should now be so positioned that its long movable contact engages the first stationary contact spaced one switch position counterclockwise from the long stationary contact. Switch S601B should be so positioned that its long movable contact engages the stationary contact spaced two switch positions counterclockwise from the long stationary contact.

c. If the switches do not take their proper positions or do not settle down, adjust resistor R620 gradually from its minimum resistance position until they do assume their proper positions. Use an insulated screwdriver.

d. Measure the voltage between pairs of test points on jack J601 as listed in Table LXV. The voltage between any pair of the points listed should not exceed 0.2 volt. Check that the bench set-up bridge stem is adjusted properly as given in Section II, paragraph 2-24.

e. Readjust resistor R620 to reduce these voltages to 0.1 volt. Press switch S606, if necessary, to apply the bridge supply voltage. This switch is located on the Selector Control Subassembly MX-1425A/ARC-21 chassis. For equipments including the Adapter, Keyer Group MX-1394/ARC-21, resistor R620 must be in the fully clockwise position.

f. If any selector switch either continues to turn or does not turn at all, check the corresponding relays K601 through K604, check the clutches and check the bridge voltages as indicated in Table LXIV. If all the selector switches do not turn check relays K605 and K606. Relay K605 is energized when one or more of the clutch solenoids (B606, B607, B608 and B609) is energized thereby turning the corresponding selector. Relay K605 energizes relay K606 which turns on the selector motor, B3605. The selector motor, B3605, drives the clutches.

g. Check the time-delay circuit, consisting of capacitor C606 and resistor R625, if a selector stops in between switch positions. The function of the time-delay circuit is to keep relay K606 energized during the time the switch rotors are in between contacts.

h. If a selector stops in between switch positions, also check the following listed contacts for open circuit in that position: On switch S601B front and switch S604B front, contacts number 2 and 3; on switch S602B and S603B front contacts number 8 and 9. The function of these contacts is to keep the clutch solenoids energized when the bridge switch rotors are in between positions.

i. If any of the selector switches rotate continuously even though the balance voltage is correct, check to see whether the contacts mentioned in paragraph h open when the selector switches reach the home position.

j. Check the output torque of the clutches. This should be a minimum of 30 inch-ounces except for the two thousands shafts which should be a minimum of 15 inch-ounces each. Check the torque necessary to drive the bank of switches in either the Amplifier-Filter Assembly AM-775A/ARC-21 or the Oscillator, Radio Frequency O-180A/ARC-21, each of which is associated with the troublesome unit. The Amplifier-Filter Assembly AM-775A/ARC-21 switches should require a maximum eight inch-ounces of torque to drive them and the Oscillator, Radio Frequency O-180A/ARC-21 switches should need a maximum of 4 inch-ounces of torque to drive them.

12-17. SERVO CIRCUIT CHECK. Mount the unit in position on the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Check the action of the servo mechanism in the following manner:

a. On radio set control, set controls for "VOICE" operation, "POWER" at "LOW." Set "CHANNEL" to position of known frequency.

b. Rotate "CONTROL" to "ON" and observe switch action in the unit. If all switches do not move, change "CHANNEL" setting until all switches do move.

c. When action ceases, observe switch indicator positions and note if they check with frequency selected. If settings are correct, check on one or two other frequencies. If settings are correct, the bridge and servo circuits are not at fault. Proceed to step g.

d. If one or more switches are incorrectly set, use Multimeter TS-352/U as a voltmeter and measure the voltage to ground at each bridge switch contact. Check values against those given in Table LXIV. In addition check the resistance value between adjacent contacts and compare with values given in the schematic diagram. Make these resistance checks with the power off.

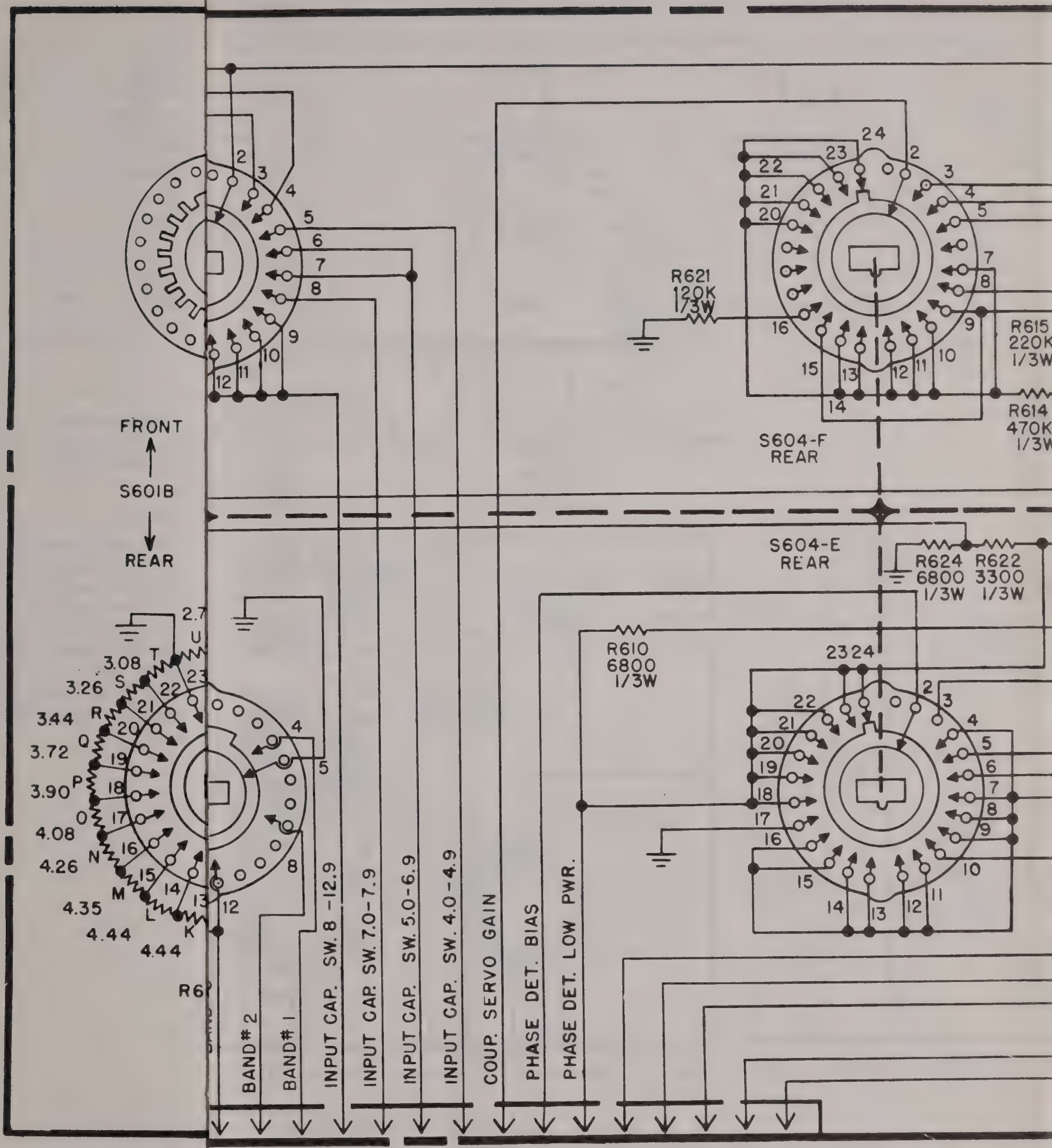
e. Replace capacitor C606 or resistor R625 if a switch rotor stops between contacts. In addition check the corresponding clutch for sufficient torque or the switch itself for binding. A switch should make a complete revolution in about two seconds.

f. If trouble is still experienced with a selector stopping between switch positions, check the following listed contacts for open circuit in that position: On switches S602B front and S604B front, contact numbers 2 and 3. On switches S602B front and S603B front, contact numbers 8 and 9. These contacts function to keep the clutch solenoids energized when the bridge switch rotors are between positions.

g. If any of the selector switches rotate continuously, even though the balance voltage is correct, check to see whether the contacts mentioned in step f open when

TABLE LXV. TEST POINTS FOR BRIDGE BALANCE

Minor test point	AB	(TP-C)	to minor test point	AC	(TP-B)	(Thousands)
Minor test point	AD	(TP-D)	to minor test point	AE	(TP-F)	(Hundreds)
Minor test point	AF	(TP-E)	to minor test point	AG	(TP-H)	(Tens)
Minor test point	AH	(TP-K)	to minor test point	AI	(TP-J)	(Units and halves)


FRONT
S601B
REAR
S604-F
REAR
S604-E
REAR
R621
120K
1/3W
R615
220K
1/3W
R614
470K
1/3W
R624
6800
1/3W
R622
3300
1/3W
R610
6800
1/3W
2.7
U
3.08
T
3.26
S
3.44
R
3.72
Q
3.90
P
O
4.08
N
4.26
M
4.35
L
4.44
K
4.44
R6
BAND#2
BAND#1
INPUT CAP. SW. 8 -12.9
INPUT CAP. SW. 7.0-7.9
INPUT CAP. SW. 5.0-6.9
INPUT CAP. SW. 4.0-4.9
COUP. SERVO GAIN
PHASE DET. BIAS
PHASE DET. LOW PWR.
X
W
V
S
R
T
N
NN
LL
JJ
EE
DD
CC
BB
AA

NOTE 1:
RESIS
OTHEF

Figure 12

movable contact engages the first stationary contact spaced one switch position counterclockwise from the long stationary contact. Switch S601B should be so positioned that its long movable contact engages the stationary contact spaced two switch positions counterclockwise from the long stationary contact.

c. If the switches do not take their proper positions or do not settle down, adjust resistor R620 gradually from its minimum resistance position until they do assume their proper positions. Use an insulated screwdriver.

d. Measure the voltage between pairs of test points on jack J601 as listed in Table LXV. The voltage between any pair of the points listed should not exceed 0.2 volt. Check that the bench set-up bridge stem is adjusted properly as given in Section II, paragraph 2-24.

e. Readjust resistor R620 to reduce these voltages to 0.1 volt. Press switch S606, if necessary, to apply the bridge supply voltage. This switch is located on the Selector Control Subassembly MX-1425A/ARC-21 chassis. For equipments including the Adapter, Keyer Group MX-1394/ARC-21, resistor R620 must be in the fully clockwise position.

f. If any selector switch either continues to turn or does not turn at all, check the corresponding relays K601 through K604, check the clutches and check the bridge voltages as indicated in Table LXIV. If all the selector switches do not turn check relays K605 and K606. Relay K605 is energized when one or more of the clutch solenoids (B606, B607, B608 and B609) is energized thereby turning the corresponding selector. Relay K605 energizes relay K606 which turns on the selector motor, B3605. The selector motor, B3605, drives the clutches.

g. Check the time-delay circuit, consisting of capacitor C606 and resistor R625, if a selector stops in between switch positions. The function of the time-delay circuit is to keep relay K606 energized during the time the switch rotors are in between contacts.

h. If a selector stops in between switch positions, also check the following listed contacts for open circuit in that position: On switch S601B front and switch S604B front, contacts number 2 and 3; on switch S602B and S603B front contacts number 8 and 9. The function of these contacts is to keep the clutch solenoids energized when the bridge switch rotors are in between positions.

i. If any of the selector switches rotate continuously even though the balance voltage is correct, check to see whether the contacts mentioned in paragraph h open when the selector switches reach the home position.

j. Check the output torque of the clutches. This should be a minimum of 30 inch-ounces except for the two thousands shafts which should be a minimum of 15 inch-ounces each. Check the torque necessary to drive the bank of switches in either the Amplifier-Filter Assembly AM-775A/ARC-21 or the Oscillator, Radio Frequency O-180A/ARC-21, each of which is associated with the troublesome unit. The Amplifier-Filter Assembly AM-775A/ARC-21 switches should require a maximum eight inch-ounces of torque to drive them and the Oscillator, Radio Frequency O-180A/ARC-21 switches should need a maximum of 4 inch-ounces of torque to drive them.

12-17. SERVO CIRCUIT CHECK. Mount the unit in position on the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Check the action of the servo mechanism in the following manner:

a. On radio set control, set controls for "VOICE" operation, "POWER" at "LOW." Set "CHANNEL" to position of known frequency.

b. Rotate "CONTROL" to "ON" and observe switch action in the unit. If all switches do not move, change "CHANNEL" setting until all switches do move.

c. When action ceases, observe switch indicator positions and note if they check with frequency selected. If settings are correct, check on one or two other frequencies. If settings are correct, the bridge and servo circuits are not at fault. Proceed to step g.

d. If one or more switches are incorrectly set, use Multimeter TS-352/U as a voltmeter and measure the voltage to ground at each bridge switch contact. Check values against those given in Table LXIV. In addition check the resistance value between adjacent contacts and compare with values given in the schematic diagram. Make these resistance checks with the power off.

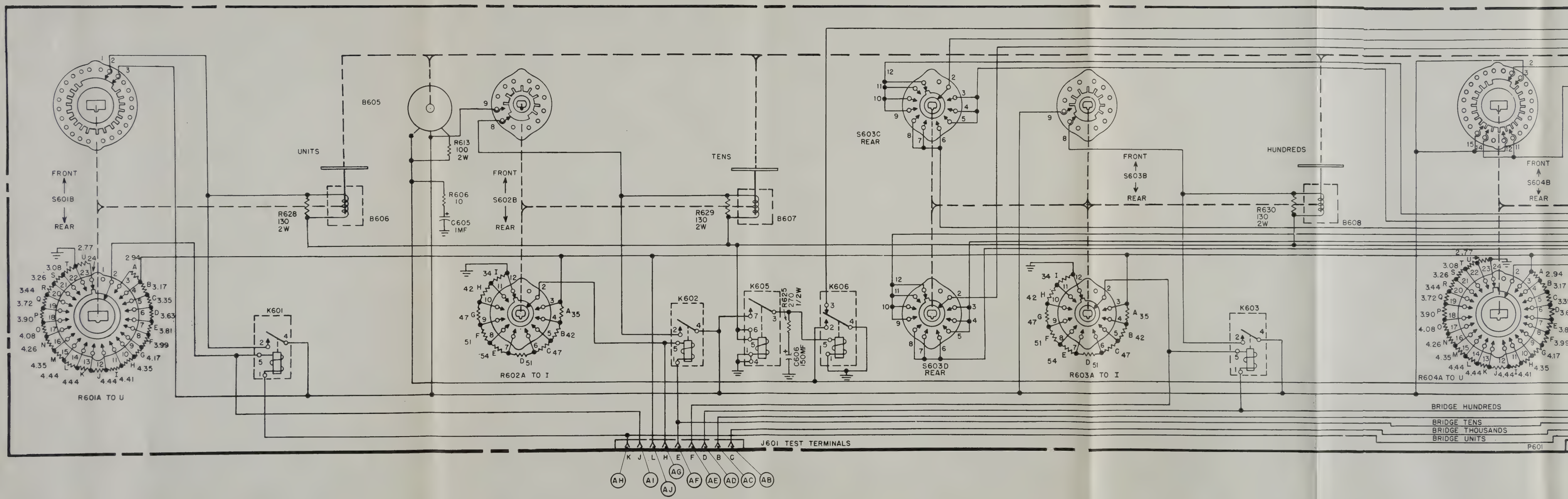
e. Replace capacitor C606 or resistor R625 if a switch rotor stops between contacts. In addition check the corresponding clutch for sufficient torque or the switch itself for binding. A switch should make a complete revolution in about two seconds.

f. If trouble is still experienced with a selector stopping between switch positions, check the following listed contacts for open circuit in that position: On switches S602B front and S604B front, contact numbers 2 and 3. On switches S602B front and S603B front, contact numbers 8 and 9. These contacts function to keep the clutch solenoids energized when the bridge switch rotors are between positions.

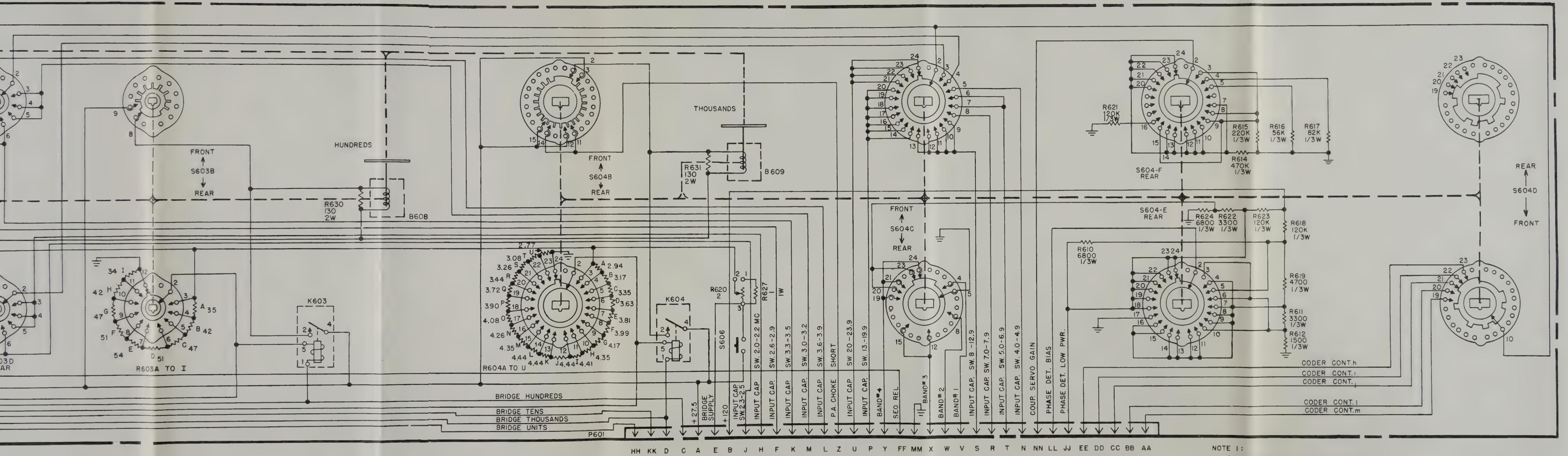
g. If any of the selector switches rotate continuously, even though the balance voltage is correct, check to see whether the contacts mentioned in step f open when

TABLE LXV. TEST POINTS FOR BRIDGE BALANCE

Minor test point	AB	(TP-C)	to minor test point	AC	(TP-B)	(Thousands)
Minor test point	AD	(TP-D)	to minor test point	AE	(TP-F)	(Hundreds)
Minor test point	AF	(TP-E)	to minor test point	AG	(TP-H)	(Tens)
Minor test point	AH	(TP-K)	to minor test point	AI	(TP-J)	(Units and halves)

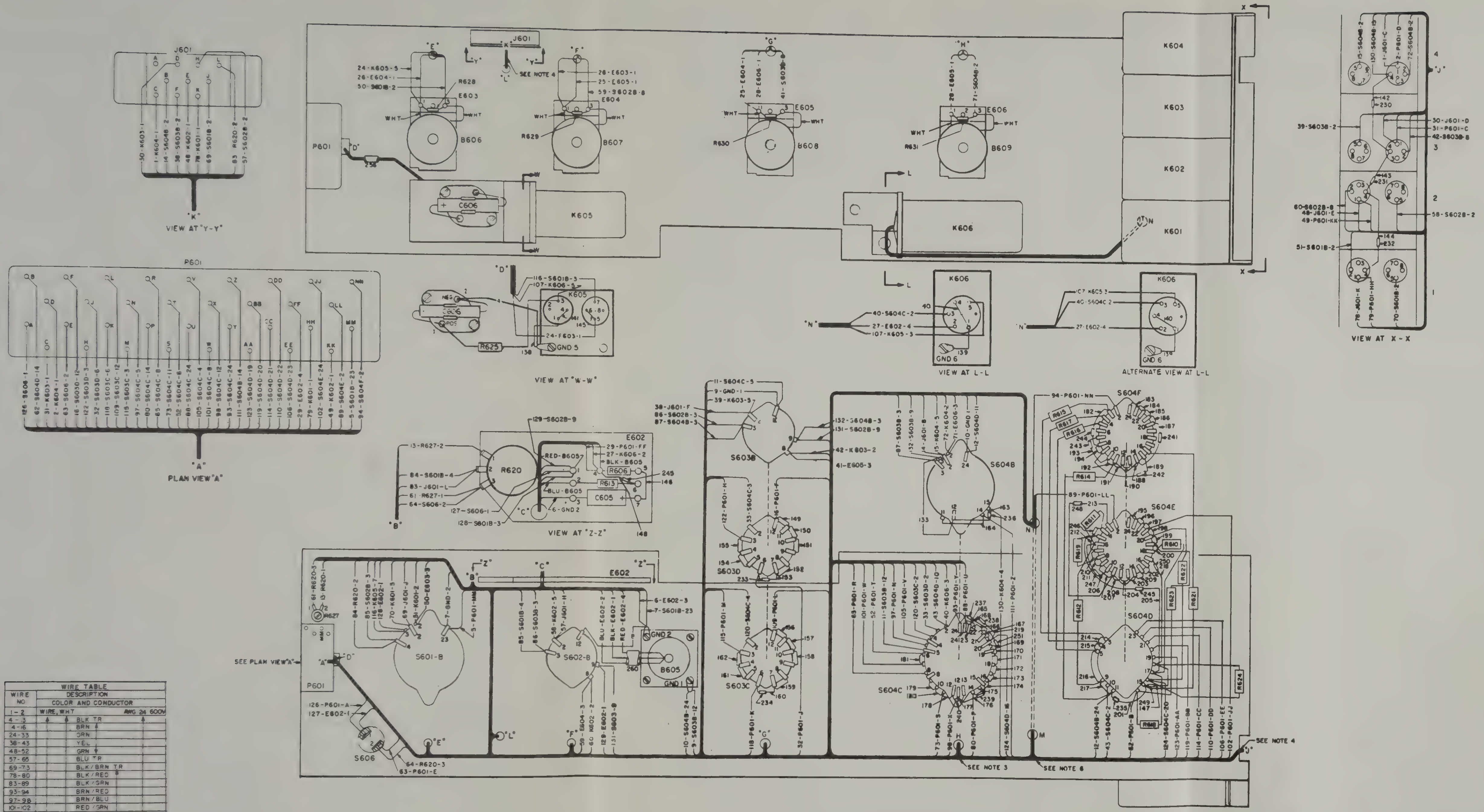


S601B
FRONT
REAR
R601A TO U
B605
UNITS
R613 100 2W
R606 10
C605 1MF
R628 130 2W
B606
K601
S602B
R602A TO I
TENS
R629 130 2W
B607
K602
K605
R625 270 1/2W
C606 150MF
K606
S603C REAR
S603D REAR
S603B
R603A TO I
HUNDREDS
R630 130 2W
B608
K603
S604B
R604A TO U
BRIDGE HUNDREDS
BRIDGE TENS
BRIDGE THOUSANDS
BRIDGE UNITS
P601
J601 TEST TERMINALS
K J L H E F D B C
AH
AI
AJ
AG
AF
AE
AD
AC
AB
2.77
2.94
3.08
3.17
3.26
3.35
3.44
3.63
3.72
3.81
3.90
3.99
4.08
4.17
4.26
4.35
4.44
4.41
34
42
47
51
54
35


HUNDREDS
FRONT
S603B
REAR
R630
130
2W
B608
THOUSANDS
FRONT
S604B
REAR
R631
130
2W
B609
S604-F
REAR
R621
120K
1/3W
R615
220K
1/3W
R616
56K
1/3W
R617
82K
1/3W
R614
470K
1/3W
REAR
S604D
FRONT
FRONT
S604C
REAR
S604-E
REAR
R624
6800
1/3W
R622
3300
1/3W
R623
120K
1/3W
R618
120K
1/3W
R610
6800
1/3W
R619
4700
1/3W
R611
3300
1/3W
R612
1500
1/3W
R603A TO I
R604A TO U
K603
K604
R620
2
R627
1
1W
S606
2.77
3.08
3.26
3.44
3.72
3.90
4.08
4.26
4.35
4.44
4.44
4.44
4.41
4.35
4.17
3.99
3.81
3.63
3.35
3.17
2.94
34
42
47
51
54
51
47
42
35
S603D
REAR
BRIDGE HUNDREDS
BRIDGE TENS
BRIDGE THOUSANDS
BRIDGE UNITS
P601
+27.5
BRIDGE SUPPLY
+120
INPUT CAP SW.2.3-2.5
INPUT CAP SW. 2.0-2.2 MC
INPUT CAP. SW. 2.6-2.9
INPUT CAP. SW. 3.3-3.5
INPUT CAP. SW. 3.0-3.2
INPUT CAP. SW. 3.6-3.9
P.A. CHOKE SHORT
INPUT CAP SW. 20-23.9
INPUT CAP. SW. 13.-19.9
BAND #4
SEQ. REL.
BAND # 3
BAND # 2
BAND # 1
INPUT CAP. SW. 8-12.9
INPUT CAP. SW. 7.0-7.9
INPUT CAP. SW. 5.0-6.9
INPUT CAP. SW. 4.0-4.9
COUP. SERVO GAIN
PHASE DET. BIAS
PHASE DET. LOW PWR.
CODER CONT. h
CODER CONT. i
CODER CONT. j
CODER CONT. l
CODER CONT. m
HH KK D C A E B J H F K M L Z U P Y FF MM X W V S R T N NN LL JJ EE DD CC BB AA

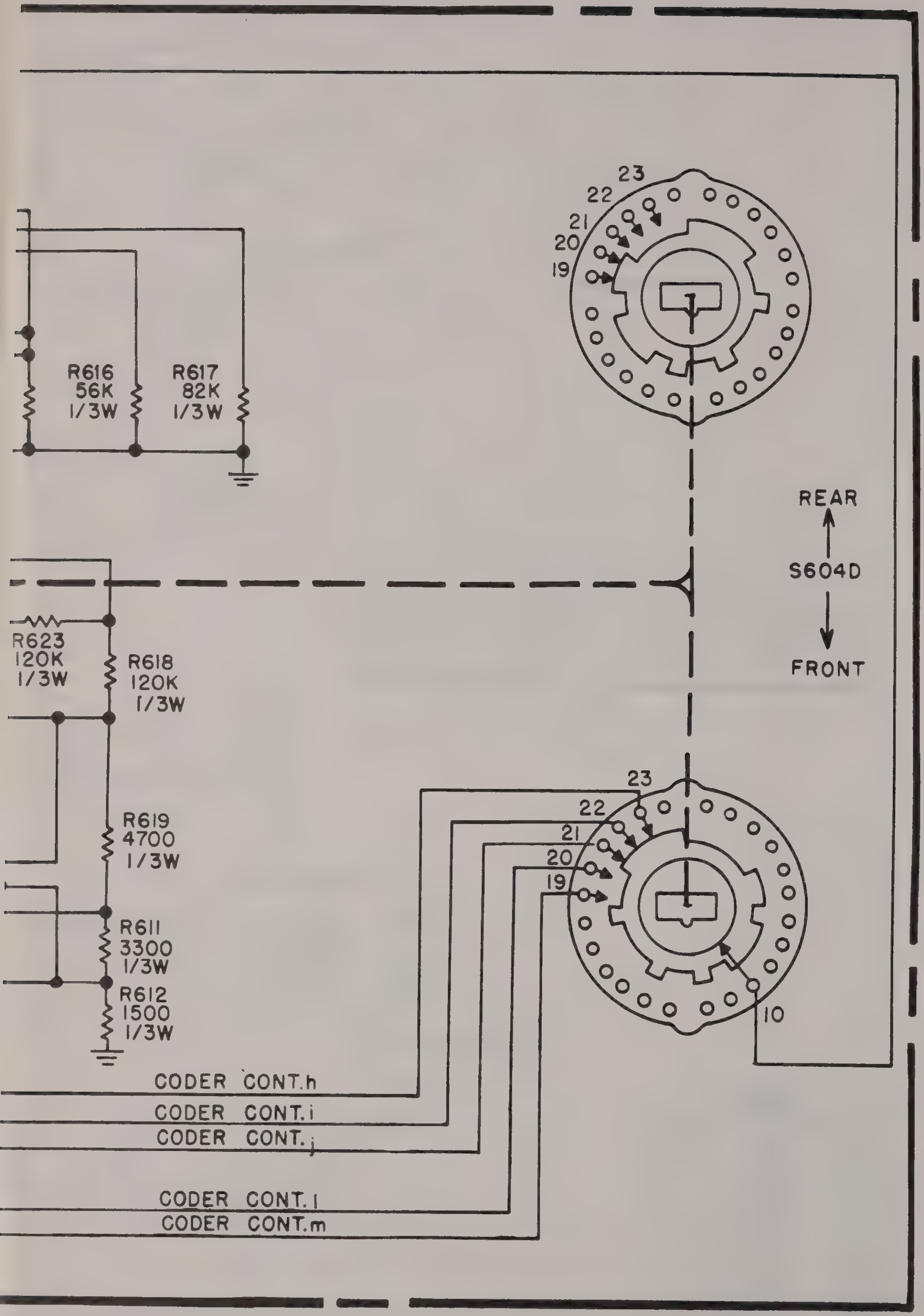
NOTE 1:
RESISTANCE VALUES IN OHMS UNLESS OTHERWISE STATED

Figure 12-3. Selector Control Subassembly MX-1425B/ARC-21, Schematic Diagram


J601
VIEW AT "Y-Y"
"K"
P601
PLAN VIEW "A"
"A"
"B"
"D"
"E"
"F"
"G"
"H"
SEE NOTE 4
R628
R629
R630
R631
E603
E604
E605
E606
B606
B607
B608
B609
WHT
C606
K605
K601
K602
K603
K604
K606
VIEW AT "W-W"
GND 5
R625
VIEW AT L-L
ALTERNATE VIEW AT L-L
GND 6
VIEW AT X-X
E602
R620
R606
R613
C605
RED-B605
BLK-B605
BLU-B605
GND 2
VIEW AT "Z-Z"
S603B
S603C
S603D
S604B
S604C
S604D
S604E
S604F
R614
R615
R616
R617
R610
R611
R612
R618
R619
R621
R622
R623
R624
S601-B
S602-B
B605
GND 1
R627
S606
SEE PLAN VIEW "A"
SEE NOTE 3
SEE NOTE 6
"C"
"L"
"M"
"N"
"J"
"Z"

WIRE TABLE		
WIRE NO	DESCRIPTION COLOR AND CONDUCTOR	
1-2	WIRE, WHT	AWG 24 600V
4-3	BLK TR	
4-16	BRN	
24-33	ORN	
38-43	YEL	
48-52	GRN	
57-65	BLU TR	
69-73	BLK/BRN TR	
78-80	BLK/RED	
83-89	BLK/GRN	
93-94	BRN/RED	
97-98	BRN/BLU	
101-102	RED/GRN	
105-107	RED/BLU	
109-111	YEL/BLK	
114-116	YEL/RED	
118-120	YEL/GRN	
122-124	GRN/BRN TR	AWG 24 600V
126-133	WHT/RED TR	AWG 20 600V
138-219	WIRE, COPPER TINNED	.020 DIA
230-251	SLEEVING, INSUL BLK	.034 I.D.
256	SLEEVING, INSUL BLK	.166 I.D.
260	SLEEVING, INSUL BLK	.166 I.D.

Figure 12-4. Selector Control Subassembly MX-1425B/ARC-21, Connection Diagram


23
22
21
20
19
R616
56K
1/3W
R617
82K
1/3W
REAR
S604D
FRONT
R623
120K
1/3W
R618
120K
1/3W
R619
4700
1/3W
R611
3300
1/3W
R612
1500
1/3W
23
22
21
20
19
10
CODER CONT.h
CODER CONT.i
CODER CONT.j
CODER CONT.l
CODER CONT.m

ANCE VALUES IN OHMS UNLESS
WISE STATED

3. Selector Control Subassembly MX-1425B/ARC-21, Schematic Diagram

TABLE LXVI. MAINTENANCE CHECK LIST FOR SELECTOR CONTROL SUBASSEMBLY MX-1425B/ARC-21

I. VISUAL INSPECTION	
UNIT	CHECK FOR
1. Chassis, components	Dents, cracks, bent pins, corrosion, stripped threads, dirt, dust, discoloration, burned or deteriorated insulation.
2. Gearing	Broken teeth.
3. Clutch output torque	30 in.-oz (15 in.-oz for thousands shafts)
4. Servo circuit	Observe switch action as "CHANNEL" setting is changed. (See paragraph 12-17.)
II. ADJUSTMENT	PROCEDURE
Bridge Balance	Adjust R620 for proper switch position and voltage at J601. (See paragraph 12-16.)

the selector switches reach home position.

h. Use great care when replacing the necessary component to prevent further damage. Also use care so as not to rotate the individual switches 180 degrees out of position with each other when driven by the same shaft. When replacing a clutch, the entire clutch, including its gear and switch shaft, should be removed. Use care not to insert the shaft 180 degrees out of position relative to the switch positions. Do not replace the "thousands" clutch B609 at this level of maintenance since a special jig is required. Refer the chassis to Depot Maintenance.

i. With switches functioning properly, the remainder of the circuits can be checked by using Multimeter TS-352/U and measuring the resistance and voltage in accordance with Table LXIII, LXIV and the data on the chart beside the schematic diagram, figure 12-3.

SECTION XIII

MAINTENANCE INSTRUCTIONS FOR AMPLIFIER-DETECTOR AM-777A/ARC-21

13-1. TROUBLE ANALYSIS.

13-2. GENERAL. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

13-3. In accordance with routine checking procedure the chassis should be examined carefully for visible evidence of damage or distress that could cause faulty operation. If relays are suspected as cause of trouble they may be checked by reference to schematic diagram, figure 13-4. When realignment is indicated, refer to paragraph 13-17 for details of procedure.

13-4. The checking procedure for locating circuit troubles can be performed as tabulated in table LXVII. Circuits found defective can be checked by reference to voltage and resistance charts in tables LXVIII, LIX, LXX. After correcting obvious faults, connect the unit into the AN/ARC-21 bench test setup by means of patch cables. Leave cable W701 and plug P703 disconnected.

TABLE LXVII. TROUBLE ANALYSIS CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 13-4

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	2* (J703)	Plug Multimeter ME-75/ARC-21 into jack J703. Set selector switch at position "5"	Radio Set Control C-451A/ARC-21 set for "VOICE" operation, "CONTROL" at "ON" "NOISE" maximum, "VOLUME," maximum "CW TUNE" midway	+120 volts (Plate supply)	+B supply leads open or shorted
2	2* (J703)	Selector switch at position "10" a-c power supply only	Same as step 1	13.5 volts ac (Fil. supply)	
3	2* (J703)	Selector switch at position "6" d-c power supply only	Same as step 1	13.5 volts dc (Fil. supply)	
4	2* (J703)	Selector switch at position "7"	Same as step 1	-20 volts (Bias supply)	Incorrect +B current drain
5	2* (J703)	Selector switch at position "8"	Same as step 1	-8 volts approx (500-kc injection)	Incorrect drive
6	N** (TP-A)	Multimeter ME-75/ARC-21. Insulated probe, clip to chassis. Selector switch at "+HI IMP"	Same as step 1	E (Amplified undelayed avc) approx +6 to +20 volts no signal -15 to -20 volts max signal	See text
7	R** (TP-B)	Same as step 6 (Selector switch at "-HI IMP")	Same as step 1	-10 to -18 volts (1500-kc injection voltage)	V710 or Z707

TABLE LXVII. TROUBLE ANALYSIS CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21 (continued)

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
8	O** (TP-C)	Same as step 7	Same as step 1 except change to "CW BROAD"	-22 to -30 volts (195-kc injection voltage)	V711 or Z708
9	P** (TP-D)	Same as step 6	Same as step 1	No signal +10 volts nominal signal +16 volts (Squelch, plate voltage)	V708B
10	Q** (TP-E)	Same as step 7	Same as step 1	No signal 0 max signal -40 to -50 (avc voltage)	V715 and V706B. If no signal indication is positive, check tubes V701, V703, and V704 for gas
11	Q** (TP-E)	Voltmeter TS-375/U on 1-2 volt scale	Same as step 8	No signal, 0 volts	If indication is positive, check tubes V701, V703, and V704 for gas
12	Q** (TP-E)	Same as step 11 except voltmeter on 12-volt scale	Same as step 8 except "VOLUME" full counterclockwise	No signal -10 volts	Shorts or broken leads. Check resistors R776 and R777
13	Q** (TP-E)	Same as step 11 except voltmeter on 3-volt scale	Same as step 1 except "VOLUME" full counterclockwise	No signal -2.6 volts	Shorts or broken leads. Check resistors R776 and R777

*Major test point.
**Minor test point.

13-5. STAGE GAIN MEASUREMENTS.

13-6. If, after the Amplifier-Detector AM-777A/ARC-21 has been aligned, the sensitivity is low, the gain of each stage may be measured to localize the trouble. Couple the Signal Generator TS-413/U into the circuit as given in table LXXI. The accuracy of signal generator frequency should be within ±100 cycles of the frequency indicated in the table.

13-7. 300-KC AND 1800-KC STAGE GAIN MEASUREMENT. To check the gain of these stages proceed as follows:

a. Set the "NOISE" to the maximum clockwise position and turn the equipment on.

b. Connect the Voltmeter TS-375/U to minor test point N, TP-A on terminal board E717. Use the d-c probe and set the meter on the ±12-volt scale.

c. Connect the Signal Generator TS-413/U to the circuits indicated in table LXXIII and adjust output for a reading of ±1 volt on the voltmeter.

d. Record the generator output in microvolts and proceed until all measurements have been made.

e. Compute the db gain for each stage. This gain should be within ±3 db of that indicated by the table. If no 1500-kc injection is indicated for the test, the cable to plug P702 should be disconnected.

13-8. 105-KC STAGE GAIN MEASUREMENT. To check the 105-kc stage gain proceed as follows:

a. Set the function switch to "CW BROAD" or "SHARP" as indicated in table LXXIII. Set the "VOLUME" control to maximum clockwise position and the "CW TUNE" control to the center of travel.

b. Connect the Output Meter TS-585A/U to the headphone jack in the bench test setup junction box. Set the output meter for 150 ohms impedance and the 500-milliwatt scale.

c. Connect the Signal Generator TS-413/U through a coupling capacitor to particular stage to be checked. The capacitor value, tube pin, and other necessary data are given in table LXXIII.

d. Adjust the signal generator to the exact frequency by switching to "CW SHARP" and tuning the signal generator for maximum reading on the output meter. Vary the signal generator output to keep the output meter reading at approximately 50 milliwatts.

e. Compute the db gain for the stages indicated. This gain should be within ±3 db of that indicated by the table.

13-9. AUDIO FREQUENCY GAIN. Use the following procedures to check the gain of the audio-frequency stages.

a. Set the function switch to either "CW SHARP" or

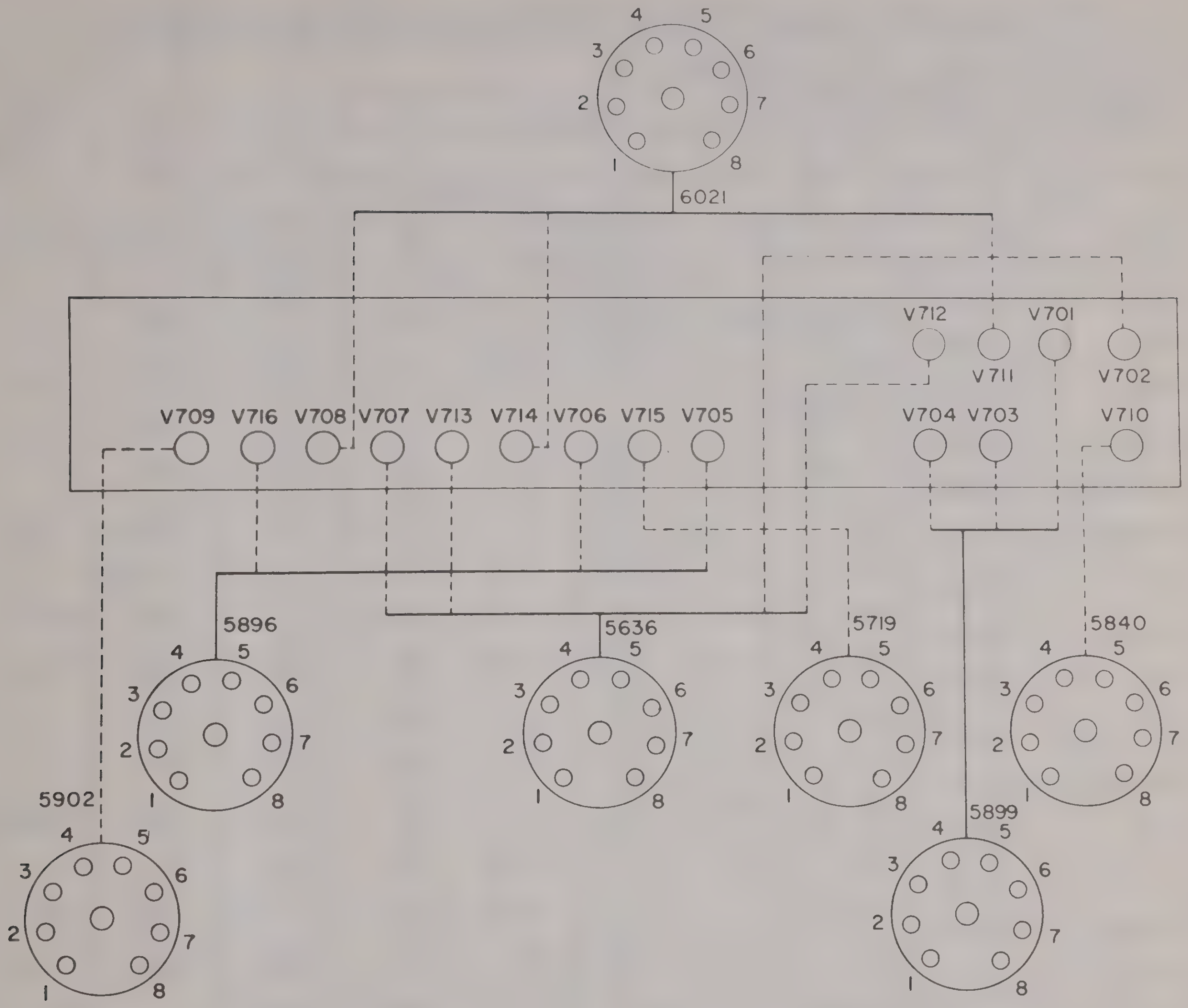

6021
V712
V701
V711
V702
V709
V716
V708
V707
V713
V714
V706
V715
V705
V704
V703
V710
5896
5636
5719
5840
5902
5899
1
2
3
4
5
6
7
8

Figure 13-1. Amplifier-Detector AM-777A/ARC-21, Tube Location

TABLE LXVIII. RESISTANCE IN OHMS, FROM PLUG, P701, PINS TO GROUND AMPLIFIER-DETECTOR AM-777A/ARC-21

Pin Reading	A *	B 0	C -	D *	E -	F *	H 285k	J *	K 68k	L *
Pin Reading	M -	N -	PR 102k	S *	T *	U *	V -	W -	X -	Y -
Pin Reading	Z *	AA *	BB *	CC 390k	DD -	EE -	FF -	HH -	JJ *	KK 1.3 meg
Pin Reading	LL 390k	MM 1 meg	MN 390k							

*Infinite resistance value.

TABLE LXIX. RESISTANCE CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21

All resistance in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Conditions of test: Chassis on bench. All cables disconnected.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V701	-5899	1.06 meg	500	** *7.2	-	70k	** *5.4	150k	-
V702	-5636	495k	180	** *3.6	870k	70k	** *5.3	78k	-
V703	-5899	1.05 meg	-	** *1.5	220	70k	** *3.3	100k	-
V704	-5899	1.5 meg	235	** *3.5	-	70k	** *1.7	113k	-
V705A/B	-5896	303k	0	** *1.6	0	1.2 meg	** *0	410k	-
V706A/B	-5896	880k	320k	** *3.2	0	125k	** *0	1.4 meg	-
V707	-5636	630k	30k	** *3.2	4.6 meg	480k	** *7.2	46k	30k
V708A/B	-6021	175k	1 meg	** *13.3	1900	**	** *10.2	420k	356k
V709	-5902	160k	0	** *3.2	-	102k	** *7.0	68k	-
V710	-5840	470k	-	** *1.8	0	70k	** *3.6	31k	-
V711A/B	-6021	**	400k	** *1.7	**	0	** *0	600k	2.2 meg
V712	-5636	860k	180	** *3.7	860k	70k	** *5.4	77k	-
V713	-5636	1.05 meg	-	** *3.3	200k	115k	** *5.3	115k	820
V714A/B	-6021	420k	420k	** *10.1	0	0	** *7.2	410k	**
V715	-5719	2.4 meg	-	** 1.8	-	300k	** *3.2	-	65k
V716	-5896	47 meg	11.5k	** *3.7	0	-	** *5.3	-	-

* Pin D of plug P701 grounded for resistance measurements.
**Infinite resistance value.

TABLE LXX. VOLTAGE CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Multimeter TS-352/U.
Test Conditions: Chassis removed from unit and connected to working equipment by patch cables.

Tube			Pin Number							
Symbol	Type	Condition	1	2	3	4	5	6	7	8
V701	5899	"VOICE"	0	1.28	25.8	-	113	19.5	68	-
		"RANGE"	2.5	2.5	50	-	250	50	250	-
		"CW"	0	1.1	25.8	-	113	19.5	74	-
V702	5636	"VOICE"	0	0.93	13.4	-6	115	19.3	78	-
		"RANGE"	-	2.5	50	10	250	50	250	-
		"CW"	0	0.93	13.4	-6	115	19.3	78	-
		"VOICE"	-1.3	-	6.84	1.25	107	13.6	76	-

TABLE LXX. VOLTAGE CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21 (continued)

Tube			Pin Number							
Symbol	Type	Condition	1	2	3	4	5	6	7	8
V703	5899	"RANGE"	10	-	10	2.5	250	50	250	-
		"CW"	-1.3	-	6.84	1.08	108	13.6	81	-
		"VOICE"	0	1.04	13.7	-	111	6.84	66	-
V704	5899	"RANGE"	2.5	2.5	50	-	250	10	250	-
		"CW"	-0.05	0.9	13.7	-	112	6.84	73	-
		"VOICE"	-0.56	0	6.84	0	0.04	0.05	5.04	-
V705	5896	"RANGE"	2.5	-	10	-	2.5	2.5	10	-
		"CW"	-0.52	0	6.84	0	-0.08	0.05	2.4	-
		"VOICE"	0	7.4	6.6	0	-0.2	0.05	0.06	-
V706	5896	"RANGE"	2.5	10	10	-	2.5	2.5	2.5	-
		"CW"	-0.47	0	6.6	0	-0.13	0.05	0.13	-
		"VOICE"	8.1	16.0	6.6	6.8	110	12.8	62	16.0
V707	5636	"RANGE"	50	50	10	50	250	50	250	50
		"CW"	9.1	18	6.6	7.1	100	12.8	62	18.0
		"VOICE"	83	0	26.5	2.5	0	19.5	0.38	10
V708	6021	"RANGE"	250	-	50	10	-	50	2.5	50
		"CW"	83	0	26.5	2.5	0	19.5	-0.57	11
		"VOICE"	-9.0	0	19.9	-	109	26	120	-
V709	5902	"RANGE"	10	-	50	-	250	50	250	-
		"CW"	-9.0	0	19.9	-	109	26	120	-
		"VOICE"	-3.1	-	6.82	0	106	13.7	27	-
V710	5840	"RANGE"	10	-	10	-	250	50	50	-
		"CW"	-3.1	-	6.82	0	116	13.7	27	-
		"VOICE"	74	-19	6.84	0.02	0	0.05	-16	74
V711	6021	"RANGE"	250	50	10	2.5	-	2.5	50	250
		"CW"	66	0	6.84	2.05	0	12.9	-4.0	42
		"VOICE"	-13.7	0	13.8	0	113	20	113	-
V712	5636	"RANGE"	50	2.5	50	50	250	50	250	-
		"CW"	0	0.86	13.8	-11.2	112	20	74	-
		"VOICE"	0	-	6.6	-	65	12.8	66	1.68
V713	5636	"RANGE"	2.5	-	10	-	250	50	250	2.5
		"CW"	-0.12	-	6.6	-	76	12.8	72	1.4
		"VOICE"	-0.17	-0.24	19.5	0	0	12.9	-19	74
V714	6021	"RANGE"	2.5	2.5	50	-	-	50	50-2.5	250-50
		"CW"	-0.17	-1.7	19.5	0	0	0.05	-0.83	22.8
		"VOICE"	0	-	6.82	-	7.38	13.6	-	112
V715	5719	"RANGE"	2.5	-	10	-	10	50	-	250
		"CW"	-0.23	-	6.82	-	0	13.6	-	112
		"VOICE"	3.8	110	13.8	0	-	19.9	-	-
V716	5896	"RANGE"	50	250	50	-	-	50	-	-
		"CW"	3.8	110	13.8	0	-	19.9	-	-

"CW BROAD," "VOLUME" maximum clockwise and "NOISE" to maximum counterclockwise position.

b. Connect the Output Meter TS-585A/U to the test bench setup phone jack in the junction box. Set the output meter for 150 ohms impedance and the 500 milliwatt scale.

c. Disable the negative feed-back circuits where indicated on table LXXI by removing resistor R735 from pin 5 of tube V709.

d. Use Audio Oscillator TS-382A/U with a 0.1 microfarad capacitor in series with the signal lead. Since voltages in the order of 0.1 volt will have to be read with accuracy it may be advisable to use an external voltmeter followed by a fixed voltage divider for the voltage check. This can be done by connecting the Voltmeter TS-375/U across the oscillator output together with a voltage divider consisting of a 10,000-ohm and a 1000-ohm resistor in series. Connect the free end of the 1000-ohm resistor to ground and the free end of the 10,000-ohm resistor to the oscillator output. The junction of the resistors will then be the input signal to the equipment. This voltage divider will give 20 db of attenuation. The attenuator will not be necessary if an audio voltmeter is available which will read these low values accurately.

e. Adjust the Audio Oscillator TS-382A/U for 1000 cycles and sufficient voltage output to give a reading 50 milliwatts on the output meter. See table LXXI for values.

13-10. CIRCUIT ANALYSIS.

13-11. This unit accepts the 1800-kc output of the receiver circuits of the Amplifier-Oscillator AM-776A/ARC-21 chassis, amplifies it, and provides a second conversion to 300 kc. An electro-mechanical

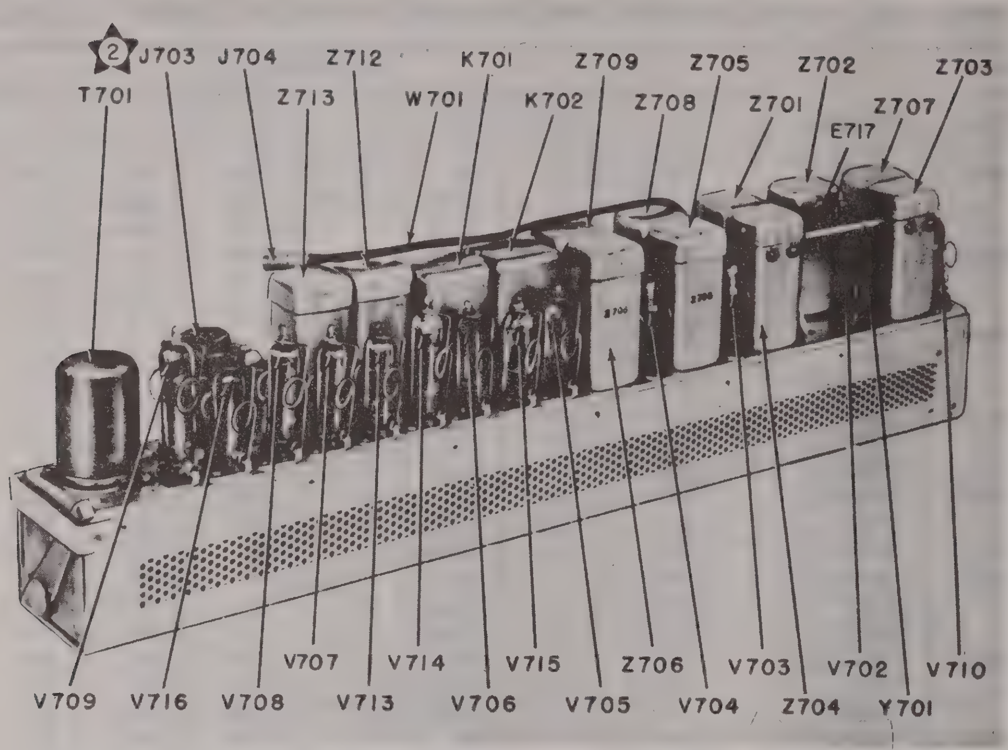

2
J703
J704
Z712
K701
Z709
Z705
Z702
Z703
T701
Z713
W701
K702
Z708
Z701
Z707
E717
V707
V714
V715
Z706
V703
V702
V710
V709
V716
V708
V713
V706
V705
V704
Z704
Y701

Figure 13-2. Amplifier-Detector AM-777A/ARC-21, Side

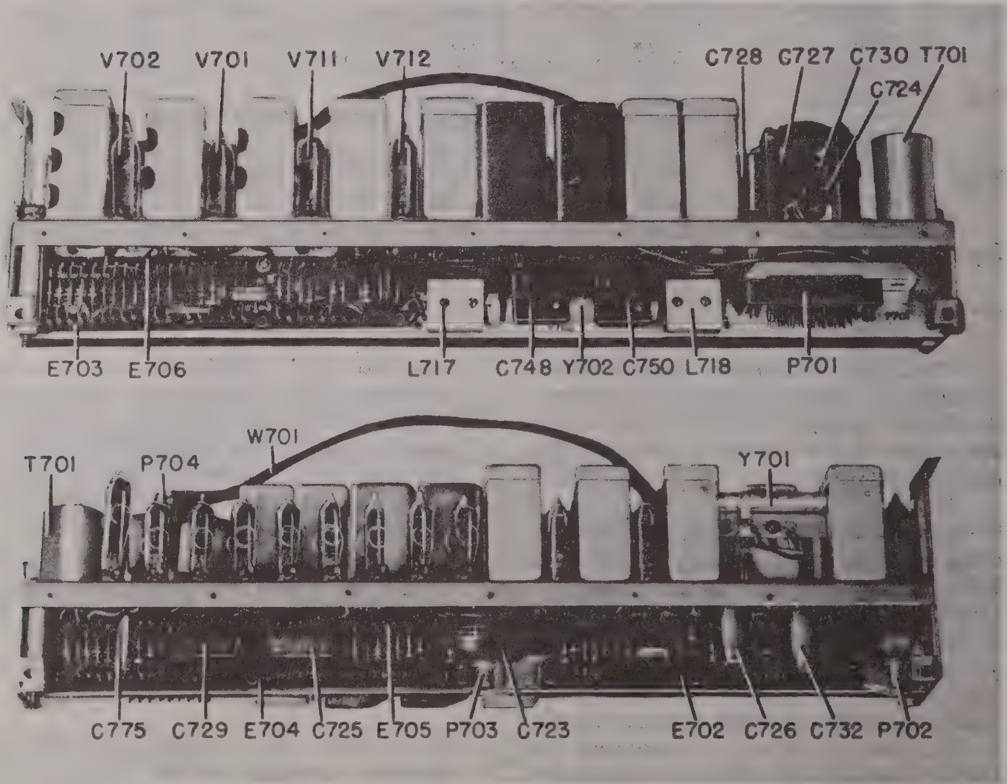

V702
V701
V711
V712
C728
C727
C730
T701
C724
E703
E706
L717
C748
Y702
C750
L718
P701
W701
T701
P704
Y701
C775
C729
E704
C725
E705
P703
C723
E702
C726
C732
P702

Figure 13-3. Amplifier-Detector AM-777A/ARC-21, Bottom, Right and Left

filter is employed in the 300-kc amplifier stage to obtain proper selectivity.

13-12. For voice reception, the 300-kc i-f signal is demodulated, passed through a series noise-limiter and an audio amplifier to provide audio output. Delayed audio avc is used to maintain constant audio output with modulation percentages in excess of 30 percent and r-f avc to control amplifier gain. Squelch is also provided to silence non-reception periods.

13-13. For cw reception, the 300-kc signal is converted to 105 kc and passed through an electro-mechanical filter for sharp selectivity or a tuned circuit for broad selectivity. The 105-kc signal is mixed with the output of a 106-kc bfo to provide the 1-kc audio note which is fed into the audio amplifier to provide the audio output. Table LXVIII gives the resistance between pins of plug P701 and ground.

13-14. ALIGNMENT, ADJUSTMENT, AND CHECKS.

13-15. GENERAL. Paragraphs 13-16 through 13-26 describe alignment, adjustment, and checking procedures for Amplifier-Detector AM-777A/ARC-21.

13-16. Table LXXIII is a maintenance check list summarizing maintenance procedures for this component. It lists preliminary inspection procedures, tabulates all alignment and adjustments, and lists tests that will assure field maintenance personnel that a repaired Amplifier-Detector AM-777A/ARC-21 meets minimum acceptable standards of performance. Table LXXIII may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

13-17. ALIGNMENT.

13-18. Complete alignment of the chassis involves three separate procedures for the 300-kc, 105-kc, and the 1500-kc and 1800-kc circuits. One or more of these procedures should be employed as required.

13-19. 300-KC ALIGNMENT. With the chassis connected to the bench test setup, proceed as follows:

a. Set function switch to "VOICE" and "NOISE" control to counterclockwise position. These controls are on the Radio Set Control C-451A/ARC-21.

b. Move wire number 382 (figure 13-5), connecting socket X706 pin 1 to terminal board E705 terminal 22, away from the control grid, pin 1 of socket X703, and back near the chassis.

c. Connect Signal Generator TS-413/U through a 0.1-microfarad capacitor to pin 1 of socket X702.

d. Connect the Voltmeter TS-375/U to minor test point N, TP-A of terminal board E717 on top of the chassis. Set the meter for the +22-volt d-c range. This meter will indicate the value of the amplified avc voltage E_k.

e. Switch the Radio Set AN/ARC-21 and the test equipment on and allow them to warm up for twenty minutes.

f. Adjust signal generator to 300-kc ±100 cycles and adjust input to obtain an E_k reading of between +1 and +5 volts.

g. Adjust in turn transformers Z706, Z705, Z704, and Z703 for minimum meter reading. Modify input level when necessary to keep the output voltage reading between +1 and +5 volts.

h. Return the "NOISE" control to the maximum clockwise position and modify the signal generator output for a reading of +1 volt on the TS-375/U Voltmeter. Note the generator output reading in microvolts.

i. Increase signal generator output approximately four or five decibels above value noted in step h. Move wire number 382 toward control grid pin, pin 1 of socket X703 until the voltmeter reading returns to +1 volt.

NOTE

> In some sets there is an adjustment link in the form of an insulated wire near the control grid terminal, pin 1 of socket V703. This lead is soldered to one terminal of resistor R777. If such is the case in the particular equipment being adjusted, wire number 382 is not to be moved. Degeneration and feedback are adjusted by means of this link.

13-20. 105-KC ALIGNMENT. Use signal generator and voltmeter as in the 300-kc alignment. In addition connect the Output Meter TS-585A/U to the test bench setup phone jack. Set the output meter for 150 ohms impedance and the multiplier for 500 milliwatts output. Proceed as follows:

a. Change the function switch on the Radio Set Control C-451A/ARC-21 to "CW SHARP," "VOLUME" control to maximum, and "CW TUNE" to the mid-position.

b. Set the Signal Generator TS-413/U for 300 kc ±100 cycles and adjust Z708 for maximum audio output as indicated on Output Meter TS-585A/U. Vary the signal generator input to keep the output at approximately 50 milliwatts during adjustment.

c. Change function switch to "CW BROAD" and adjust transformers Z712 and Z709 for maximum audio output.

d. Approximately 30 microvolts will be required for 50 milliwatts output in either the "CW BROAD" or "CW SHARP" position.

13-21. 1500-KC and 1800-KC ALIGNMENT. Set the Radio Set Control C-451A/ARC-21 function switch to "VOICE" and the "NOISE" control maximum clockwise.

a. Connect the Voltmeter TS-375/U, to minor test point R, TP-B, on the terminal board E717. Use the d-c probe and set voltmeter to the -12-volt scale.

b. Connect the 500-kc source from the Oscillator, Radio Frequency O-180A/ARC-21 using one of the test cables supplied.

c. Adjust the cores of transformer Z707, first the top core, then the middle, and finally the bottom core for maximum output as indicated on the voltmeter. The voltage should be approximately -8 volts.

d. Connect the Signal Generator TS-413/U through a 10-micromicrofarad capacitor to minor test point S, plug P704, and change Voltmeter TS-375/U to minor test point N, TP-A on terminal board E717. Use the d-c probe and set the voltmeter for the +12-volt scale.

e. Adjust the signal generator to 1800 kc ±100 cycles

TABLE LXXI. STAGE GAIN CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21

Item	Normal Stage Gain (db)	Input Typical	Output Volts E	Tube or Plug	Frequency	Coupling Cap.	1500-kc Injection	Percent Modulation 1000 Cycles	Output in Milliwatts	Function Switch
1		76,000 uv	+1	V704-1	300 kc	0.1 uf	No	0	-	"VOICE"
2	+46.4	362 uv	+1	V703-1	300 kc	0.1 uf	No	0	-	"VOICE"
3	-4.0*	560 uv	+1	V702-1	1800 kc	0.1 uf	Yes	0	-	"VOICE"
4	+19.6	74 uv	+1	V701-1	1800 kc	0.1 uf	Yes	0	-	"VOICE"
5	-20.8	600 uv	+1	P704	1800 kc	10 uuf	Yes	0	-	"VOICE"
6			+1	P704	1800 kc	10 uuf	Yes	30	min 50	"VOICE"
7			+1	P704	1800 kc	10 uuf	Yes	90	max 250	"VOICE"
8		100 uv	0	P704	1800 kc	10 uuf	Yes	0	min 50	"CW SHARP"
9		200 uv	0	P704	1800 kc	10 uuf	Yes	0	min 50	"CW BROAD"
10	†		+4 to +5	P704	1800 kc	10 uuf	Yes	0	-	"VOICE"
11	6.6	1300 uv	0	V712-1	300 kc	0.1 uf	Opt.	-	50	"CW SHARP"
12	33	2800 uv	-	V712-1	105 kc	0.1 uf	Opt.	-	50	"CW SHARP"
13		45,000 uv	-	V713-1	105 kc	0.1 uf	Opt.	-	50	"CW SHARP"
14		6400 uv	-	V712-1	300 kc	0.1 uf	Opt.	-	50	"CW BROAD"
15		11,000 uf	-	V712-1	105 kc	0.1 uf	Opt.	-	50	"CW BROAD"
16		2.5 v	-	V709-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
17**	7.5	1.5 v	-	V709-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
18	14††	1.05 v	-	V708-2	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
19**	20.9	0.21 v	-	V708-2	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
20	-10.5	0.095 v	-	V707-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
21		0.32	-	V706-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"

* 0 to 6 db loss depending on amount of r-f degeneration used.
** Negative feedback resistor R735 open.
† Squelch should close when voltmeter reads +4 to +5 volts, thus disabling the audio system.
†† Db of negative feedback.
Items 8 to 10 inclusive: Minimum performance.

TABLE LXXII. SELECTIVITY FIGURES, FILTER Y701

Frequency = 1800 kc, Voltmeter reading E = +1 for all cases.

Input Voltage Ratio	Decibels	Typical Performance Measurements
E	0	
2XE	6	+3.8 kc
2XE	6	-3.8 kc minimum
1000XE	60	+10.5 kc
1000XE	60	-10.5 kc maximum

and modify the input to keep the voltage indicated on the voltmeter between +1 and +5 volts. Tune the transformers for minimum reading on the voltmeter.

f. Align transformers Z702 and Z701 keeping the voltage indicated by the voltmeter between +1 and +5 volts. On completion of alignment adjust signal generator for 600 microcolts output, adjust transformer Z701, top, clockwise until E_k equals +1 volt.

13-22. 300-KC SELECTIVITY MEASUREMENTS.

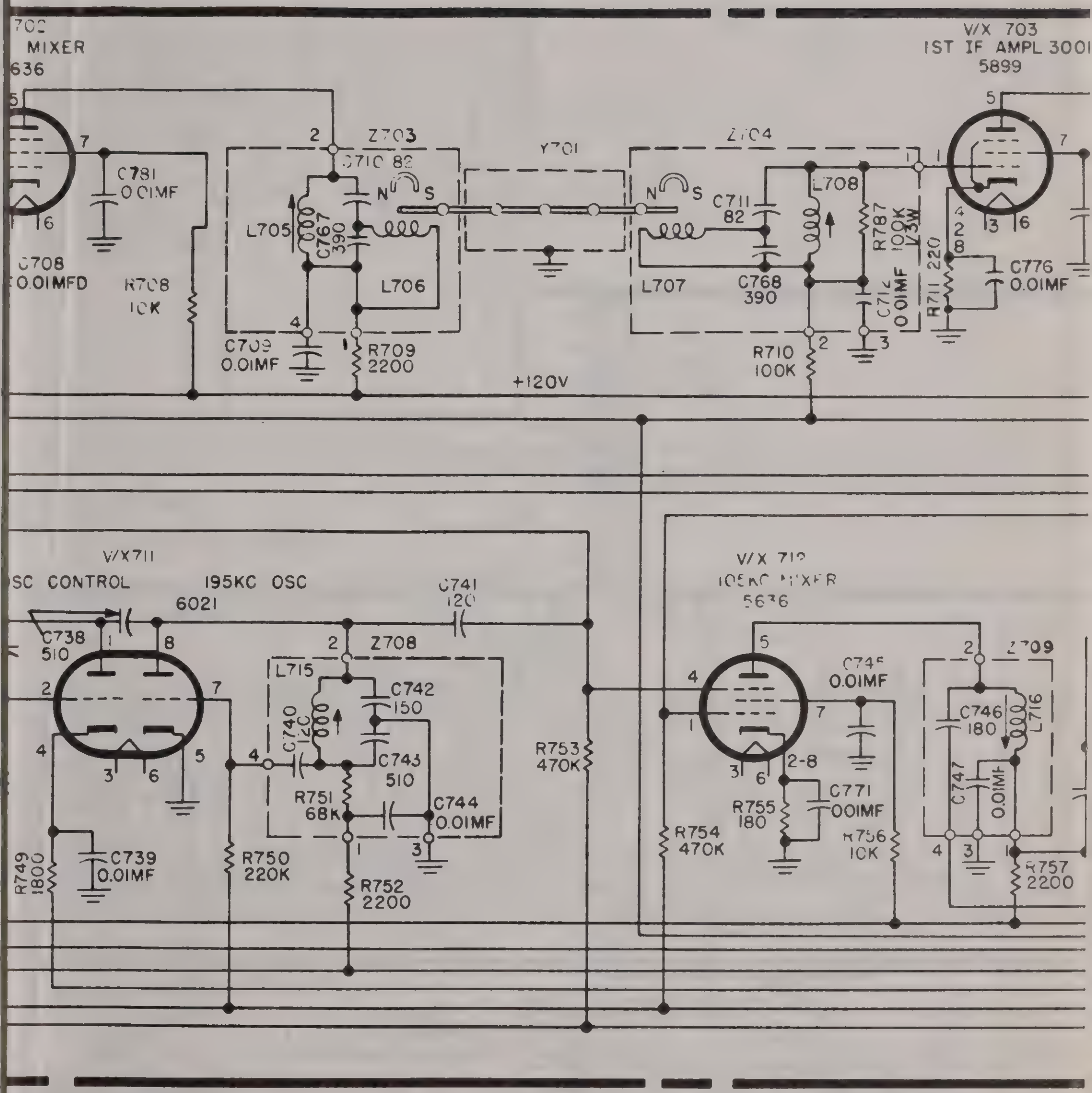
The "VOICE" selectivity of Radio Set AN/ARC-21 is primarily determined by the 300-kc magnetostriction filter Y701. Check the selectivity as follows:

a. Connect Signal Generator TS-413/U to minor test point S (P704) through a 10-micromicrofarad capacitor. Attach the Voltmeter TS-375/U to minor test point N, (TP-A on terminal board E717) and ground, using the d-c probe. Set voltmeter to +12-volt scale.

b. Set function switch to "VOICE" and "NOISE" control to maximum clockwise position.

c. Adjust signal generator for 1800 kilocycles ±100 cycles and sufficient signal to give a reading of +1 volt on the voltmeter. Note the number of microvolts required.

d. Double the number of microvolts required in step c, and swing the signal generator to both sides of resonance until a reading of +1 volt is indicated on the voltmeter. Record the frequencies.



70?
MIXER
636
V/X 703
1ST IF AMPL 300
5899
Z703
C710 82
N S
Y701
Z704
C711
82
L708
R787
100K
1/3W
L705
C767
390
L706
L707
C768
390
C712
0.01MF
C781
0.01MF
C708
0.01MFD
R708
10K
C709
0.01MF
R709
2200
R710
100K
R711 220
C776
0.01MF
+120V
V/X711
OSC CONTROL
195KC OSC
6021
C741
120
C738
510
Z708
L715
C742
150
C740
120
C743
510
R751
68K
C744
0.01MF
C739
0.01MF
R749
1800
R750
220K
R752
2200
R753
470K
V/X 712
105KC MIXER
5636
C745
0.01MF
C771
0.01MF
R755
180
R754
470K
R756
10K
Z709
C746
180
L716
C747
0.01MF
R757
2200

TABLE LXXI. STAGE GAIN CHART, AMPLIFIER-DETECTOR AM-777A/ARC-21

Item	Normal Stage Gain (db)	Input Typical	Output Volts E	Tube or Plug	Frequency	Coupling Cap.	1500-kc Injection	Percent Modulation 1000 Cycles	Output in Milliwatts	Function Switch
1		76,000 uv	+1	V704-1	300 kc	0.1 uf	No	0	-	"VOICE"
2	+46.4	362 uv	+1	V703-1	300 kc	0.1 uf	No	0	-	"VOICE"
3	-4.0*	560 uv	+1	V702-1	1800 kc	0.1 uf	Yes	0	-	"VOICE"
4	+19.6	74 uv	+1	V701-1	1800 kc	0.1 uf	Yes	0	-	"VOICE"
5	-20.8	600 uv	+1	P704	1800 kc	10 uuf	Yes	0	-	"VOICE"
6			+1	P704	1800 kc	10 uuf	Yes	30	min 50	"VOICE"
7			+1	P704	1800 kc	10 uuf	Yes	90	max 250	"VOICE"
8		100 uv	0	P704	1800 kc	10 uuf	Yes	0	min 50	"CW SHARP"
9		200 uv	0	P704	1800 kc	10 uuf	Yes	0	min 50	"CW BROAD"
10	†		+4 to +5	P704	1800 kc	10 uuf	Yes	0	-	"VOICE"
11	6.6	1300 uv	0	V712-1	300 kc	0.1 uf	Opt.	-	50	"CW SHARP"
12	33	2800 uv	-	V712-1	105 kc	0.1 uf	Opt.	-	50	"CW SHARP"
13		45,000 uv	-	V713-1	105 kc	0.1 uf	Opt.	-	50	"CW SHARP"
14		6400 uv	-	V712-1	300 kc	0.1 uf	Opt.	-	50	"CW BROAD"
15		11,000 uf	-	V712-1	105 kc	0.1 uf	Opt.	-	50	"CW BROAD"
16		2.5 v	-	V709-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
17**	7.5	1.5 v	-	V709-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
18	14††	1.05 v	-	V708-2	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
19**	20.9	0.21 v	-	V708-2	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
20	-10.5	0.095 v	-	V707-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"
21		0.32	-	V706-1	1000 cycles	0.1 uf	-	-	50	"CW BROAD"

* 0 to 6 db loss depending on amount of r-f degeneration used.

** Negative feedback resistor R735 open.

† Squelch should close when voltmeter reads +4 to +5 volts, thus disabling the audio system.

†† Db of negative feedback.

Items 8 to 10 inclusive: Minimum performance.

TABLE LXXII. SELECTIVITY FIGURES, FILTER Y701

Frequency = 1800 kc, Voltmeter reading E = +1 for all cases.

Input Voltage Ratio	Decibels	Typical Performance Measurements
E	0	
2XE	6	+3.8 kc
2XE	6	-3.8 kc minimum
1000XE	60	+10.5 kc
1000XE	60	-10.5 kc maximum

and modify the input to keep the voltage indicated on the voltmeter between +1 and +5 volts. Tune the transformers for minimum reading on the voltmeter.

f. Align transformers Z702 and Z701 keeping the voltage indicated by the voltmeter between +1 and +5 volts. On completion of alignment adjust signal generator for 600 microcolts output, adjust transformer Z701, top, clockwise until E_k equals +1 volt.

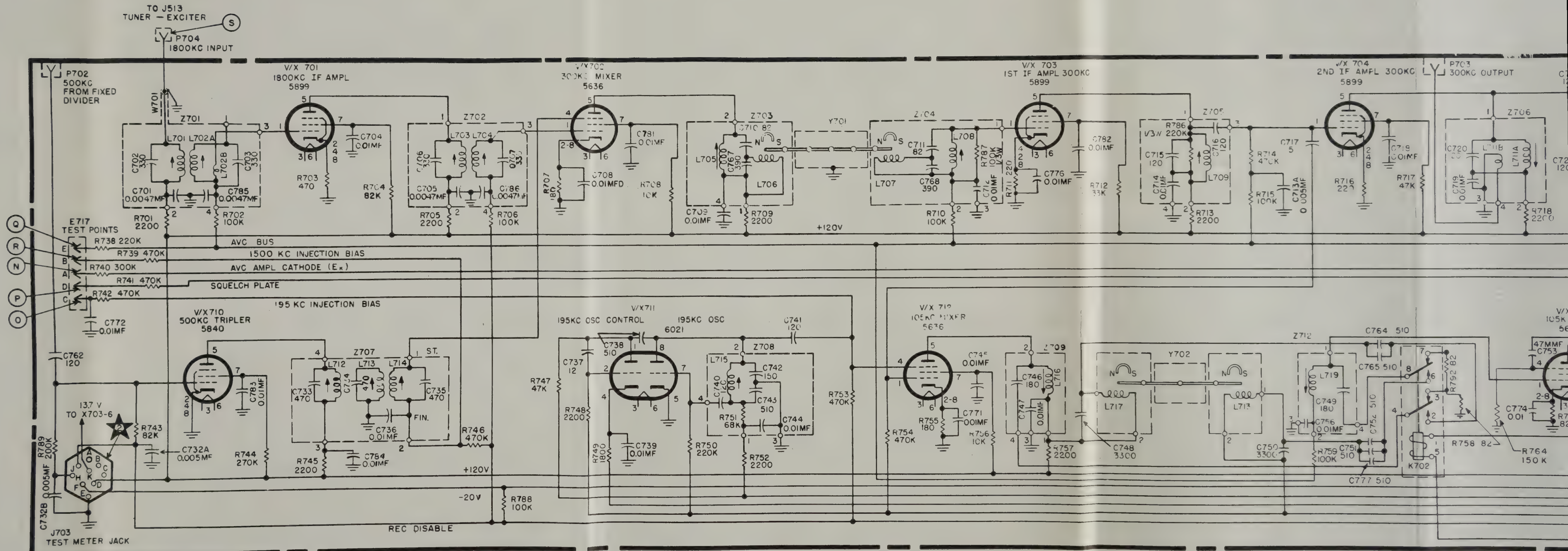
13-22. 300-KC SELECTIVITY MEASUREMENTS. The "VOICE" selectivity of Radio Set AN/ARC-21 is primarily determined by the 300-kc magnetostriction filter Y701. Check the selectivity as follows:

a. Connect Signal Generator TS-413/U to minor test point S (P704) through a 10-micromicrofarad capacitor. Attach the Voltmeter TS-375/U to minor test point N, (TP-A on terminal board E717) and ground, using the d-c probe. Set voltmeter to +12-volt scale.

b. Set function switch to "VOICE" and "NOISE" control to maximum clockwise position.

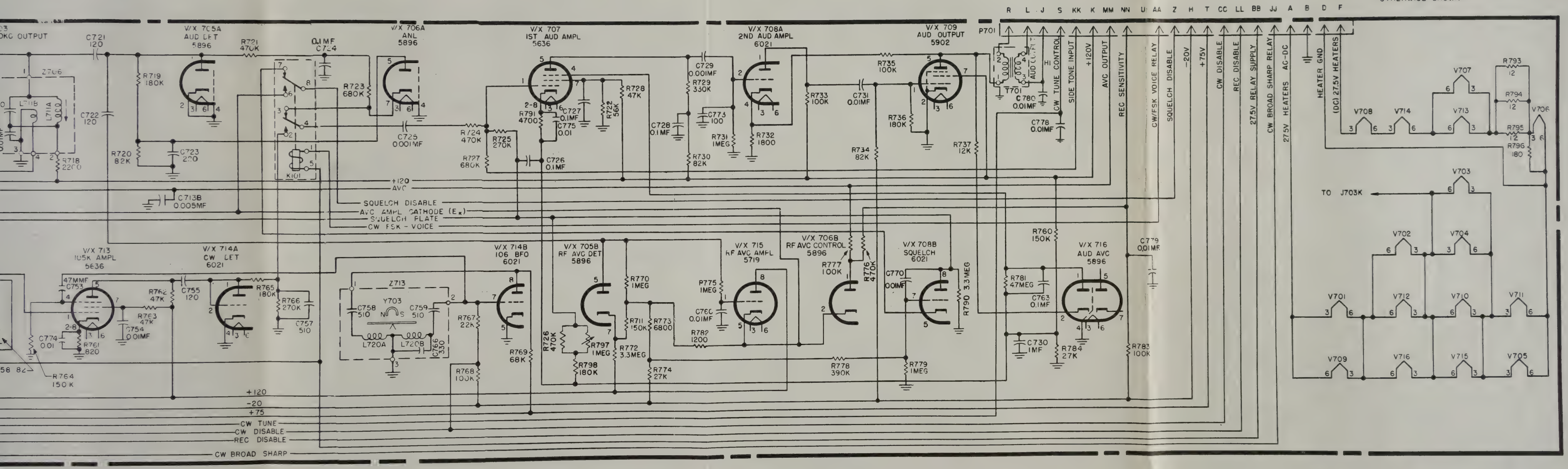
c. Adjust signal generator for 1800 kilocycles ±100 cycles and sufficient signal to give a reading of +1 volt on the voltmeter. Note the number of microvolts required.

d. Double the number of microvolts required in step c, and swing the signal generator to both sides of resonance until a reading of +1 volt is indicated on the voltmeter. Record the frequencies.


TO J513
TUNER — EXCITER
S
P704
1800KC INPUT
P702
500KC
FROM FIXED
DIVIDER
W701
Z701
L701 L702A
L702B
C702 330
C703 330
C701 0.0047MF
C785 0.0047MF
V/X 701
1800KC IF AMPL
5899
C704 0.01MF
R703 470
R704 82K
R701 2200
R702 100K
Z702
L703 L704
C706 330
C707 330
C705 0.0047MF
C786 0.0047MF
R705 2200
R706 100K
V/X702
300KC MIXER
5636
C781 0.01MF
R707 180
C708 0.01MFD
R708 10K
Z703
C710 82
L705
C767 390
L706
C709 0.01MF
R709 2200
Y701
Z704
C711 82
L707
C768 390
L708
R787 100K 1/2W
C712 0.01MF
R710 100K
+120V
V/X 703
1ST IF AMPL 300KC
5899
R711 220
C776 0.01MF
C782 0.01MF
R712 33K
Z705
R786 1/3W 220K
C715 120
C716 120
C714 0.01MF
L709
R713 2200
R714 470K
R715 100K
C717 5
C713A 0.005MF
V/X 704
2ND IF AMPL 300KC
5899
C719 0.01MF
R716 220
R717 47K
P703
300KC OUTPUT
Z706
C720
L711B
L711A
C718 0.01MF
R718 2200
E717
TEST POINTS
Q
R
N
P
O
E
B
A
D
C
R738 220K
R739 470K
R740 300K
R741 470K
R742 470K
AVC BUS
1500 KC INJECTION BIAS
AVC AMPL CATHODE (Ex)
SQUELCH PLATE
195 KC INJECTION BIAS
C772 0.01MF
C762 120
V/X710
500KC TRIPLER
5840
C783 0.01MF
Z707
L712 L713 L714
ST.
C733 470
C734 470
C735 470
FIN.
C736 0.01MF
R744 270K
R745 2200
C754 0.01MF
R746 470K
13.7 V
TO X703-6
R743 82K
C732A 0.005MF
R789 200K
C732B 0.005MF
J703
TEST METER JACK
+120V
-20V
R788 100K
REC DISABLE
V/X711
195KC OSC CONTROL
195KC OSC
6021
C738 510
C737 12
R747 47K
R748 2200
R749 180
C739 0.01MF
C741 120
Z708
L715
C740 160
C742 150
C743 510
R751 68K
C744 0.01MF
R750 220K
R752 2200
R753 470K
V/X 712
105KC MIXER
5636
C745 0.01MF
R754 470K
R755 180
C771 .001MF
R756 10K
Z709
C746 180
L716
C747 0.01MF
R757 2200
L717
C748 3300
Y702
L718
C750 3300
Z712
L719
C749 180
C756 0.01MF
R759 100K
C751 510
C752 510
C777 510
C764 510
C765 510
R792 82
R758 82
K702
R764 150 K
C774 0.01
47MMF
C753
105K

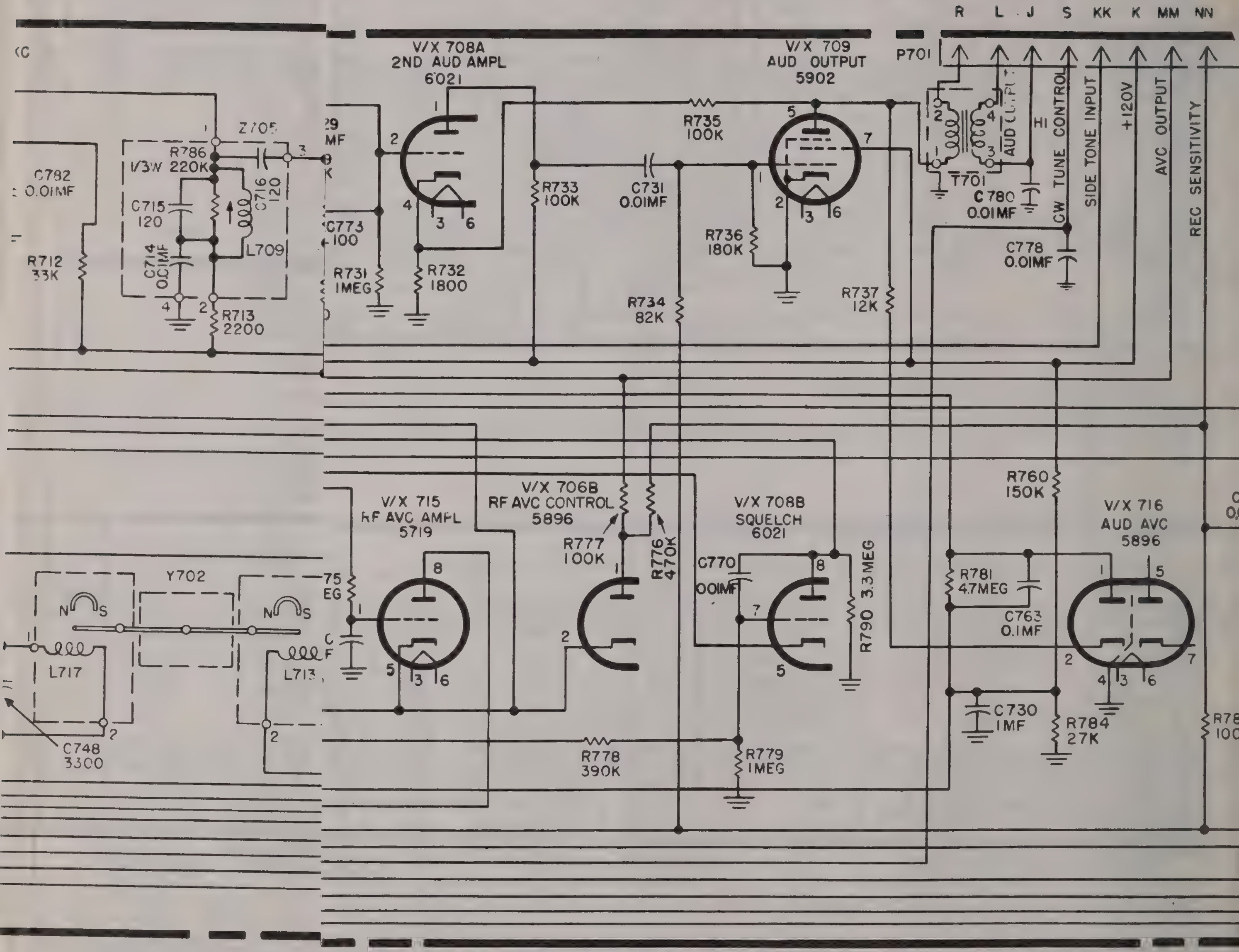
NOTE 1
ALL CAPACITOR VALUES IN MMF
UNLESS OTHERWISE SHOWN

NOTE 2
ALL RESISTORS 1/2 WATT UNLESS
OTHERWISE SHOWN



OKC OUTPUT
C721 120
Z706
L711B
L711A
C722 120
R718 2200
R719 180K
R720 82K
C723 220
C713B 0.005MF
V/X 705A AUD DET 5896
R721 470K
0.1MF C724
K101
V/X 706A ANL 5896
R723 680K
C725 0.001MF
R724 470K
R725 270K
R727 680K
C726 0.1MF
V/X 707 1ST AUD AMPL 5636
R791 4700
C727 0.1MF
C775 0.01
R722 56K
R728 47K
C729 0.001MF
R729 330K
C728 0.1MF
R730 82K
C773 100
R731 1MEG
V/X 708A 2ND AUD AMPL 6021
R732 1800
R733 100K
R735 100K
C731 0.01MF
R736 180K
R734 82K
V/X 709 AUD OUTPUT 5902
R737 12K
P701
T701
C780 0.01MF
C778 0.01MF
AUDIO
HI
R L J S KK K MM NN U AA Z H T CC LL BB JJ A B D F
CW TUNE CONTROL
SIDE TONE INPUT
+120V
AVC OUTPUT
REC SENSITIVITY
CW/FSK VOICE RELAY
SQUELCH DISABLE
-20V
+75V
CW DISABLE
REC DISABLE
27.5V RELAY SUPPLY
CW BROAD SHARP RELAY
27.5V HEATERS
AC-DC
HEATER GND
(DC) 27.5V HEATERS
V708
V714
V707
V713
V706
R793 12
R794 12
R795 12
R796 180
V703
TO J703K
V702
V704
V701
V712
V710
V711
V709
V716
V715
V705
+120
AVC
SQUELCH DISABLE
AVC AMPL CATHODE (Ex)
SQUELCH PLATE
CW FSK - VOICE
V/X 713 105K AMPL 5636
47MMF C753
C774 0.01
R761 820
R764 150K
R762 47K
R763 47K
C754 0.01MF
C755 120
V/X 714A CW DET 6021
R765 180K
R766 270K
C757 510
Z713
Y703
C758 510
C759 510
L720A
L720B
C766 330
R767 22K
R768 100K
V/X 714B 106 BFO 6021
R769 68K
V/X 705B RF AVC DET 5896
R726 470K
R797 1MEG
R798 180K
R770 1MEG
R711 150K
R773 6800
R772 3.3MEG
R774 27K
R775 1MEG
C760 0.01MF
R782 1200
V/X 715 RF AVC AMPL 5719
V/X 706B RF AVC CONTROL 5896
R777 100K
R776 470K
R778 390K
C770 .001MF
V/X 708B SQUELCH 6021
R790 3.3MEG
R779 1MEG
R760 150K
R781 47MEG
C763 0.1MF
C730 1MF
R784 27K
V/X 716 AUD AVC 5896
C779 0.01MF
R783 100K
+120
-20
+75
CW TUNE
CW DISABLE
REC DISABLE
CW BROAD SHARP

Figure 13-4. Amplifier-Detector AM-777A/ARC-21, Schematic Diagram


R L J S KK K MM NN
P701
V/X 708A
2ND AUD AMPL
6021
V/X 709
AUD OUTPUT
5902
Z705
R786
1/3W 220K
C782
0.01MF
C715
120
C716
120
C714
0.01MF
L709
R712
33K
R713
2200
C773
100
R731
1MEG
R732
1800
R733
100K
C731
0.01MF
R735
100K
R736
180K
R734
82K
R737
12K
T701
AUD OUTPUT
HI
C780
0.01MF
C778
0.01MF
CW TUNE CONTROL
SIDE TONE INPUT
+120V
AVC OUTPUT
REC SENSITIVITY
V/X 715
RF AVC AMPL
5719
V/X 706B
RF AVC CONTROL
5896
R777
100K
R776
470K
V/X 708B
SQUELCH
6021
C770
.001MF
R790 3.3MEG
R760
150K
V/X 716
AUD AVC
5896
R781
4.7MEG
C763
0.1MF
C730
1MF
R784
27K
Y702
L717
L713
C748
3300
R778
390K
R779
1MEG

Figu

TABLE LXXIII. MAINTENANCE CHECK LIST FOR AMPLIFIER-DETECTOR AM-777A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
Chassis, components	Dents, cracks, corrosion, stripped threads, dirt, dust, discoloration, burned or deteriorated insulations.

II. ALIGNMENT

					OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. 300 kc Alignment	13-19	TS-413/U	X702-1	300 kc	TS-375/U	E717, TP-A	Minimum Reading	Adjust Z703 through Z706 function switch to "VOICE", "NOISE" control counter-clockwise.
2. 105 kc Alignment	13-20	TS-413/U	X702-1	300 kc	TS-375/U TS-585A/U	E717, TP-A phone jack of bench test setup	Maximum Audio Output	Adjust Z708 with function switch in "CW SHARP." Adjust Z712, Z709 with function switch "CW BROAD" "VOLUME" control at max "CW TUNE" in mid-position throughout.
3. 1500 & 1800 kc Alignment	13-21	500KC from Oscillator Radio Frequency O-180A/ARC-21			TS-375/U	E717, TP-B	Maximum Reading	Adjust Z707. Function switch in "VOICE" "NOISE" control max. clockwise.
		TS-413/U	P704 TP-S	1800 kc	TS-375/U	E717, TP-A	Minimum Reading	Adjust Z702, Z701.

III. MINIMUM PERFORMANCE

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. 300 kc Selectivity	13-22	TS-413/U	P704	1800 kc Center frequency	TS-375/U	E717, TP-A	--	6 db bandwidth = 7.6 kc min. 60 db bandwidth = 21 kc max.
2. CW Sensitivity	13-20	TS-413/U	X702-1	30 uv. 300 kc	TS-375/U	E717, TP-A	50mw	"VOLUME" control max. clockwise, "CW TUNE" control in mid-position throughout, function switch in "CW SHARP," then "CW BROAD."
3. Squelch Disable	Table LXVII	TS-413/U	X702-1	1800 kc	TS-375/U	E717, TP-A	4-5v	Same as above except function switch in "VOICE."

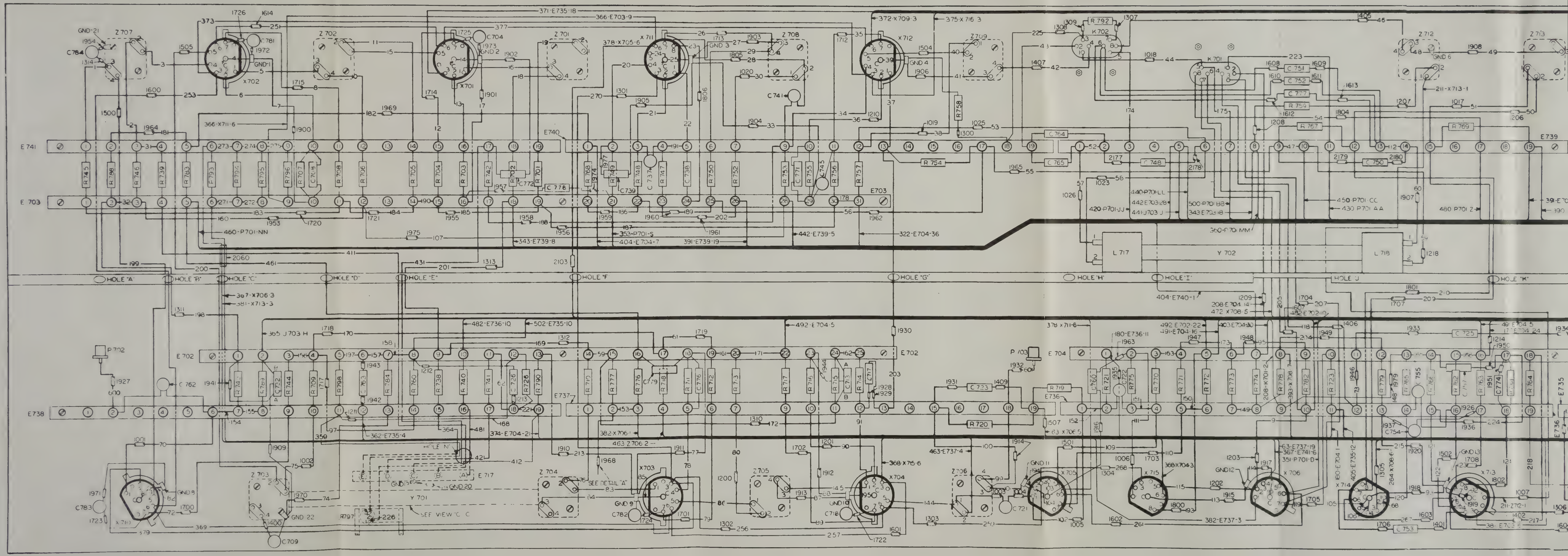
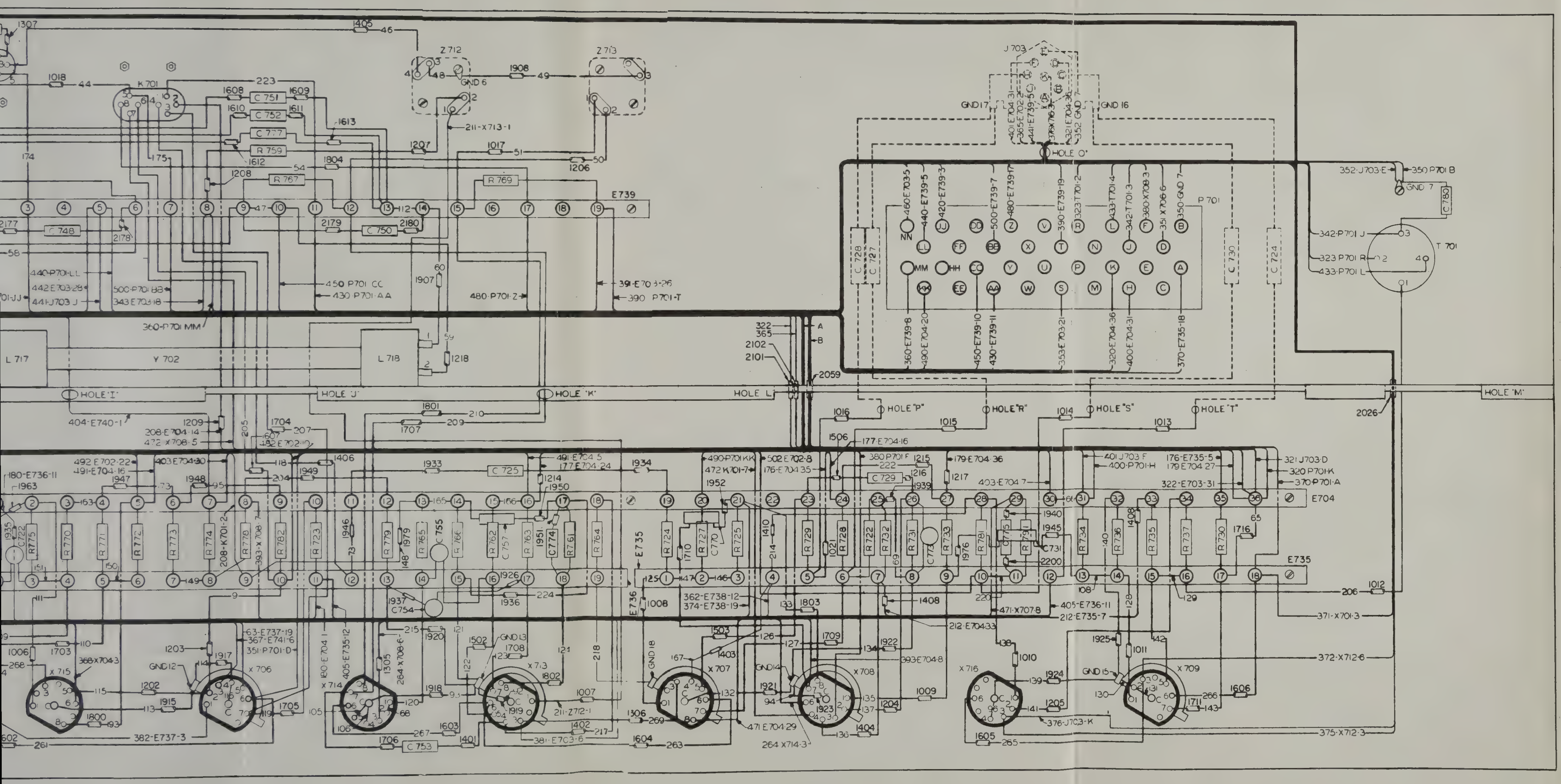
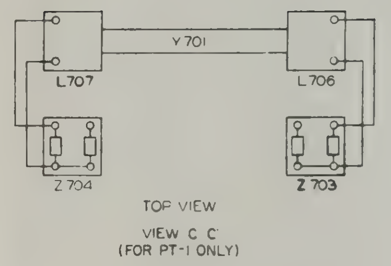

E 741
E 703
E740
E703
E739
E 702
E 704
E738
E737
E736
E735
E 717
HOLE "A"
HOLE "B"
HOLE "C"
HOLE "D"
HOLE "E"
HOLE "F"
HOLE "G"
HOLE "H"
HOLE "I"
HOLE "J"
HOLE "K"
HOLE "N"
Z 707
Z 702
Z 701
Z 708
Z709
Z 712
Z 713
Z 703
Z 704
Z 705
Z706
x702
X701
X 711
X712
K 702
K 701
L 717
Y 702
L 718
X 703
X704
X 705
X 715
X 706
X 714
X 713
X 710
Y 701
P 702
P 703
C784
C781
C704
C741
C 762
C783
C709
C782
C718
C 721
C754
R797
SEE DETAIL "A"
SEE VIEW "C" C
GND 1
GND 2
GND 3
GND 4
GND 6
GND 8
GND 9
GND 10
GND 11
GND 12
GND 13
GND 20
GND 22
GND-21
371-E735-18
366-E703-9
372-X709-3
375-X716-3
378-X705-6
366-X711-6
460-P701-NN
343-E739-8
353-P701-S
404-E704-7
391-E739-19
442-E739-5
322-E704-36
360-P701-MM
440-P701-LL
442-E703-28
441-J703-J
420-P701-JJ
500-P701-BB
343-E703-18
450-P701-CC
430-P701-AA
480-P701-Z
404-E740-1
208-E704-14
472-X706-5
307-X706-3
381-X713-3
365-J703-H
482-E736-10
502-E735-10
492-E704-5
378-X711-6
180-E736-11
492-E702-22
491-E704-16
403-E704-20
362-E735-4
374-E704-21
382-X706-1
463-Z706-2
368-X715-6
463-E737-4
63-X706-5
368-X704-3
63-E737-19
367-E741-6
351-P701-D
382-E737-3
211-X713-1
211-Z712-1
38-E703-6

Figure 13-5. Amplifier-Detector AM-777A/ARC-21, Connection Diagram

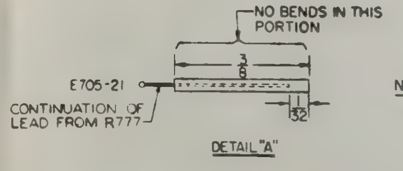

Z 712
Z 713
J 703
K 701
P 701
T 701
E739
E704
E735
E736
Y 702
L 717
L 718
HOLE 'I'
HOLE 'J'
HOLE 'K'
HOLE L
HOLE 'M'
HOLE 'O'
HOLE "P"
HOLE "R"
HOLE "S"
HOLE "T"
GND 6
GND 7
GND 16
GND 17
X 715
X 706
X 714
X 713
X 707
X 708
X 716
X 709
C 724
C 728
C 727
C 730
C 780
C 751
C 752
C 777
R 759
R 767
R 769
C 748
C 750
C 725
C 729
C 753
C 754
382-E737-3
375-X712-3
372-X712-6
371-X701-3
264 X714-3
471 E704-29
376-J703-K
211-X713-1
211-Z712-1
381-E703-6


Y 701
L 707
L 706
Z 704
Z 703

TOP VIEW
VIEW C-C
(FOR PT-1 ONLY)

② SIMILAR TO PT-1 EXCEPT FOR Z703, Z704 & Y701 INCL. & THEIR CONSTITUTED COMPONENTS REPLACED WITH Z7001. FOR CONNECTION DIAGRAM OF Z7001 SEE DWG 752389-1. (EXTERNAL CONNECTIONS SAME AS PT-1 OMITTING GRDS 19 & 20). **FOR CONNECTIONS Z703 & Z704 REPLACED WITH E7003 & E7002 RESP.**

WIRE TABLE			
WIRE NO. (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR		
1 – 226	WIRE TIN COPPER BUS	.0159 DIA.	
250 – 275	TIN COPPER BUS	.0201 DIA.	
320 – 323	WHT RED TR	AWG-24	600V
342 – 343	BLU TR		
350 – 353	BLK TR		
359 – 365	GRN TR		
366 – 379	BRN/BLU TRS		
380 – 382	BRN/RED		
390 – 393	RED/BLU		
400 – 405	RED/GRN		
411 – 412	YEL/GRN		
420 – 421	BLU/BRN		
430 – 433	BLU/BLK		
440 – 442	GRN/BLK		
450	GRN/BRN		
460 – 463	YEL/RED		
471 – 472	YEL/BLK		
480 – 482	RED/BLK		
490 – 492	GRN/RED		
500 – 502	WIRE WHT BRN/RED TRS	AWG-24	600V
600 – 601	CABLE (PHOS. BR)		
1001 – 1026	SLEEVING, SILICONE RUBBER BRN	.022 ID	
1200 – 1218	SLEEVING, SILICONE RUBBER RED	.022 ID	
1300 – 1314	SLEEVING, SILICONE RUBBER WHT	.022 ID	
1400 – 1410	SLEEVING, SILICONE RUBBER YEL	.022 ID	
1500 – 1507	SLEEVING, SILICONE RUBBER GRN	.022 ID	
1600 – 1614	SLEEVING, SILICONE RUBBER BLU	.022 ID	
1700 – 1726	SLEEVING, SILICONE RUBBER VIO	.022 ID	
1800 – 1806	SLEEVING, SILICONE RUBBER GRY	.022 ID	
1900 – 1979	SLEEVING, SILICONE RUBBER BLK	.022 ID	
2026	SLEEVING, FIBERGLASS BLK	.118 ID	
2059 – 2060	SLEEVING, FIBERGLASS BLK	.085 ID	
2101 – 2103	SLEEVING, FIBERGLASS BLK	.053 ID	
2151 – 2180	SLEEVING, SILICONE RUBBER BLK	.053 ID	
2200	SLEEVING, SILICONE RUBBER BLK	.034 ID	


NO BENDS IN THIS PORTION
$\frac{3}{8}$
E705-21
CONTINUATION OF LEAD FROM R777
$\frac{1}{32}$

DETAIL "A"

NOTES

1. DRESS LEADS THRU HOLES "A" TO "T" AS SHOWN.
2. Z703, Y701 AND Z704 TO BE WIRED AS SHOWN IN AUXILIARY VIEW "C-C".
3. CABLE "A" CONSIST OF WIRE NOS. 320, 321, 370, 400, 401, 402 & 490. CABLE "B" CONSIST OF WIRE NOS. 351 & 380.
4. LEAD DRESS IS CRITICAL AND MUST BE MADE ACCORDING TO APPROVED ENGINEERING SAMPLE

TABLE LXXIII. MAINTENANCE CHECK LIST FOR AMPLIFIER-DETECTOR AM-777A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
Chassis, components	Dents, cracks, corrosion, stripped threads, dirt, dust, discoloration, burned or deteriorated insulations.

II. ALIGNMENT

					OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. 300 kc Alignment	13-19	TS-413/U	X702-1	300 kc	TS-375/U	E717, TP-A	Minimum Reading	Adjust Z703 through Z706 function switch to "VOICE", "NOISE" control counter-clockwise.
2. 105 kc Alignment	13-20	TS-413/U	X702-1	300 kc	TS-375/U TS-585A/U	E717, TP-A phone jack of bench test setup	Maximum Audio Output	Adjust Z708 with function switch in "CW SHARP." Adjust Z712, Z709 with function switch "CW BROAD" "VOLUME" control at max "CW TUNE" in mid-position throughout.
3. 1500 & 1800 kc Alignment	13-21	500KC from Oscillator Radio Frequency O-180A/ARC-21			TS-375/U	E717, TP-B	Maximum Reading	Adjust Z707. Function switch in "VOICE" "NOISE" control max. clockwise.
		TS-413/U	P704 TP-S	1800 kc	TS-375/U	E717, TP-A	Minimum Reading	Adjust Z702, Z701.

III. MINIMUM PERFORMANCE

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. 300 kc Selectivity	13-22	TS-413/U	P704	1800 kc Center frequency	TS-375/U	E717, TP-A	--	6 db bandwidth = 7.6 kc min. 60 db bandwidth = 21 kc max.
2. CW Sensitivity	13-20	TS-413/U	X702-1	30 uv. 300 kc	TS-375/U	E717, TP-A	50mw	"VOLUME" control max. clockwise, "CW TUNE" control in mid-position throughout, function switch in "CW SHARP," then "CW BROAD."
3. Squelch Disable	Table LXVII	TS-413/U	X702-1	1800 kc	TS-375/U	E717, TP-A	4-5v	Same as above except function switch in "VOICE."

e. Repeat step d with 1000 times the number of microvolts required in step c.

f. Compare results with the figures given in table LXXII to determine if the filter is acceptable or not.

13-23. ADJUSTMENT OF RESISTOR R797. Apply a 100-microvolt signal of any radio frequency, modulated at 20 to 30 percent, into the receiver antenna jack. Adjust resistor R797 for maximum audio output. This adjustment closely corresponds to the factory adjustment where resistor R797 is adjusted for minimum distortion using a carrier frequency modulated at 90 percent.

13-24. With some tubes, this adjustment may be at either end of the resistor range and not show a definite maximum. In such cases, leave the resistor set at the end which gives the greatest audio output.

13-25. MINIMUM PERFORMANCE STANDARDS.

13-26. Perform the checks indicated in part III of table LXXIII before returning a repaired Amplifier-Detector AM-777A/ARC-21 to service.

SECTION XIV

MAINTENANCE INSTRUCTIONS FOR AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21

14-1. GENERAL.

14-2. The circuits in this unit, in conjunction with the Oscillator, Radio Frequency O-180A/ARC-21 comprise the frequency control system for the AN/ARC-21 equipment. The switching system in the unit, driven by the Selector Control Sub-assembly MX-1425B/ARC-21 provides for the selection of the Units, Tens, and Hundreds comparison frequencies that are mixed and compared with a standard frequency to generate tuning control voltages for the equipment.

14-3. TROUBLE ANALYSIS.

14-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

14-5. A defective chassis should first be examined carefully for visible damage, particularly the switching mechanisms where dirt or poor contacts may cause trouble. Before connecting the chassis in the test bench setup check the resistance between the plug pins and ground and the tube pins and ground as given in tables LXXIV and LXXV respectively. See figure 14-1 for tube locations.

14-6. With any visible defects corrected and resistances measured as in the previous charts the chassis should be cabled into the test setup by means of patch cables. The trouble analysis chart, table LXXVI will provide clues to defective circuits. Further checks can be made by reference to the voltage chart in table LXXVII. Incorrect signal outputs, when tubes are known to be good, are due usually to incorrect tuning of the circuits which can be corrected

TABLE LXXIV. RESISTANCE IN OHMS, PLUG P801 TO GROUND

Conditions: Chassis removed from unit. All cables disconnected.

Pin	A	B	C	D	E	F	H	J	K
Reading	5.5	58k	120k	68k	*	*	-	0	100K to 450K
Pin	L	M	N	P	R				
Reading	50k	*	*	20.5	280k				

TABLE LXXV. RESISTANCE CHART, AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21

All resistances in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Test Conditions: Chassis removed from unit. All cables disconnected.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V801	-5636	49k	180	4.7	21	123k	5.6	*	-
V802	-5636	480k	120	5.5	15k	*	4.7	*	-
V803	-5636	85	200	2.3	2.8	*	0	*	-
V804	-5896	300k	0	2.5	0	300k	0	260k	-
V805	-5636	1 meg	850	20.5	3.2	*	17.7	*	-
V806	-5840	1.05 meg	-	20.5	0	*	17.7	*	-
V807A/B	-6021	*	950k	17.7	10.5k	50k	14.5	*	58k
V808	-5896	125k	*	11	0	*	14.5	125k	-
V809A/B	-6021	*	*	7.8	*	*	11	*	*
V810	-5840	185k	-	2.3	0	*	3.7	*	-
V811	-5636	480k	3.7	9	2 meg	*	4.7	*	-
V812	-5896	1 meg	8200	2.3	0	1.02 meg	3.7	8200	-
V813	-5636	1 meg	-	2.3	1.05 meg	*	0	*	720
V814	-6021	*	221k	4.7	0	5900	5.6	5000	*
V815	-6021	*	221k	3.7	0	5700	4.7	4900	*
V816	-5636	480k	*	4.7	2 meg	*	3.7	*	-
V817	-5840	273k	-	3.7	0	*	2.3	*	-

* Infinite resistance value.

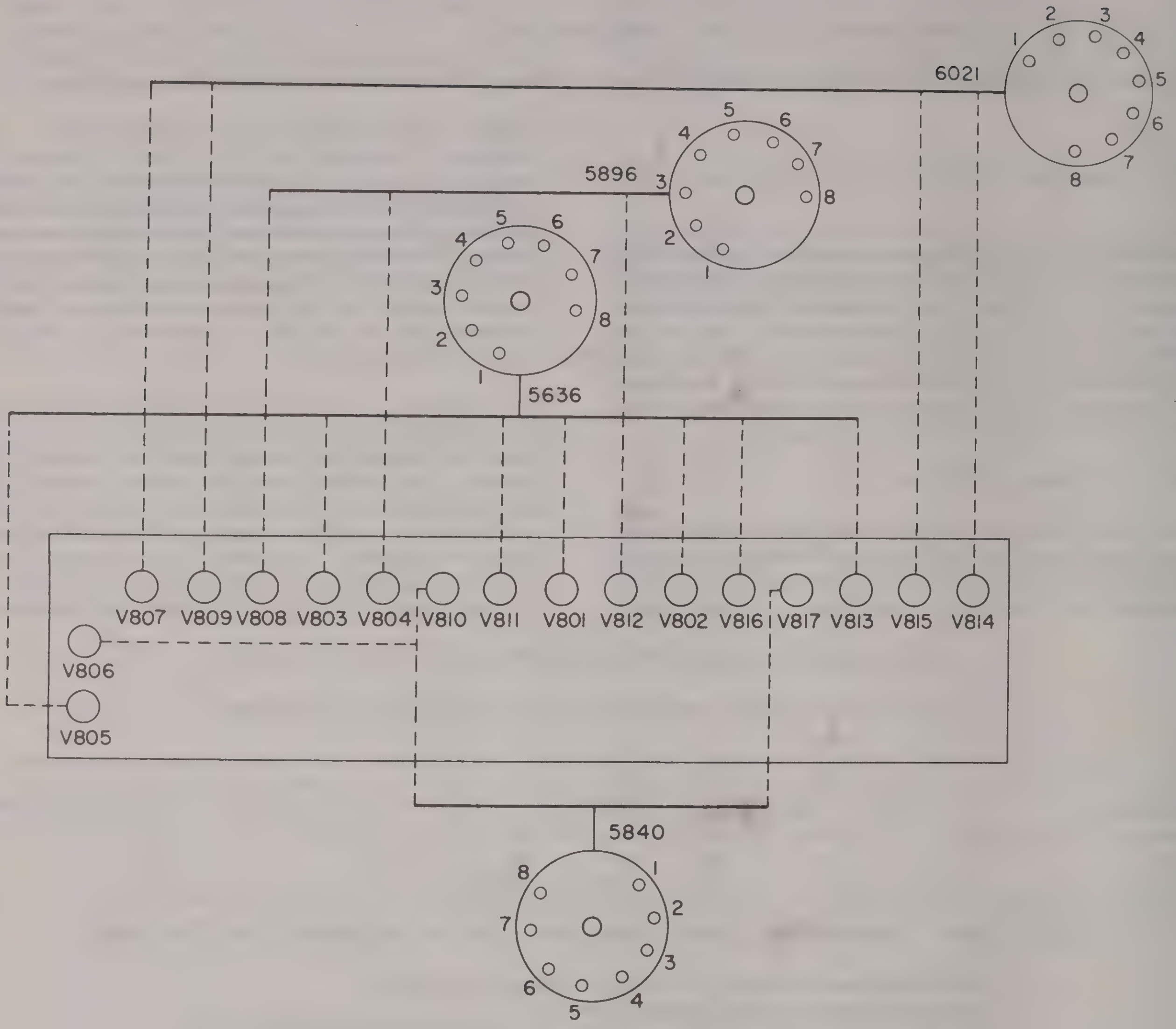


Figure 14-1. Amplifier-Filter Assembly AM-775A/ARC-21, Tube Location

by following alignment procedures in paragraph 14-10.

NOTE

For M4 version of Amplifier-Filter Assembly AM-775A/ARC-21 which includes Silicon Diode Units refer to Difference Data Sheets in Section XXIV.

14-7. ALIGNMENT, ADJUSTMENT, AND CHECKS.

14-8. GENERAL. Paragraphs 14-9 through 14-22 describe alignment, adjustment and checking procedure for Amplifier-Filter Assembly AM-775A/ARC-21.

14-9. Table LXXXII is a maintenance check list summarizing maintenance procedures for this component. It lists inspection procedures, alignments and adjustments that will assure field maintenance personnel that the Amplifier-Filter Assembly AM-775A/ARC-21 meets minimum standards of performance. Table LXXXII may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

14-10. ALIGNMENT.

14-11. Several procedures are required for a complete alignment of the unit. Complete alignment is seldom necessary, so one or more of the following procedures may be used as required.

14-12. 50-KC HARMONIC GENERATOR ALIGNMENT. Use the following procedure:

a. Remove the bottom plate and top cover from the chassis.

b. Connect the chassis to the system by test cables supplied.

c. Remove the Oscillator, Radio Frequency O-180A/ARC-21 completely from the system.

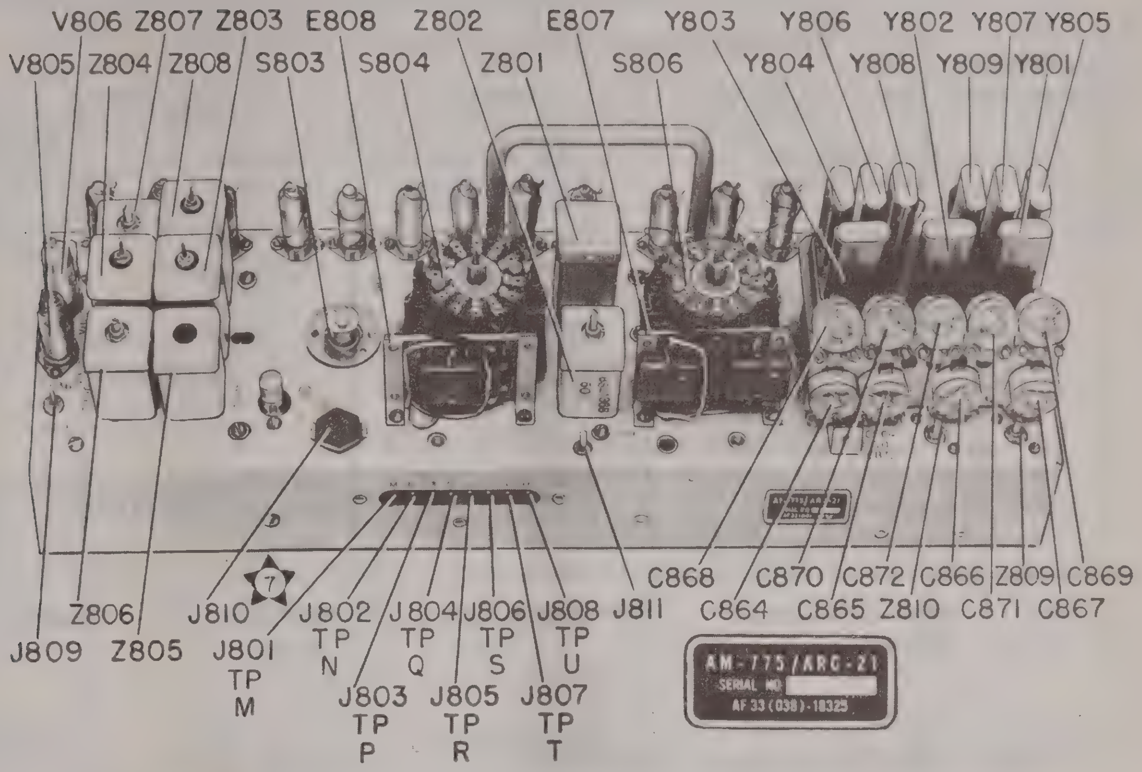

V806 Z807 Z803 E808 Z802 E807 Y803 Y806 Y802 Y807 Y805
V805 Z804 Z808 S803 S804 Z801 S806 Y804 Y808 Y809 Y801
C868 C870 C872 C866 Z809 C869
J810 J811 C864 C865 Z810 C871 C867
Z806
J809 Z805
J801 TP M
J802 TP N
J803 TP P
J804 TP Q
J805 TP R
J806 TP S
J807 TP T
J808 TP U
7
AM-775/ARC-21
SERIAL NO
AF 33 (038)-18325

Figure 14-2. Amplifier-Filter Assembly AM-775A/ARC-21, Top

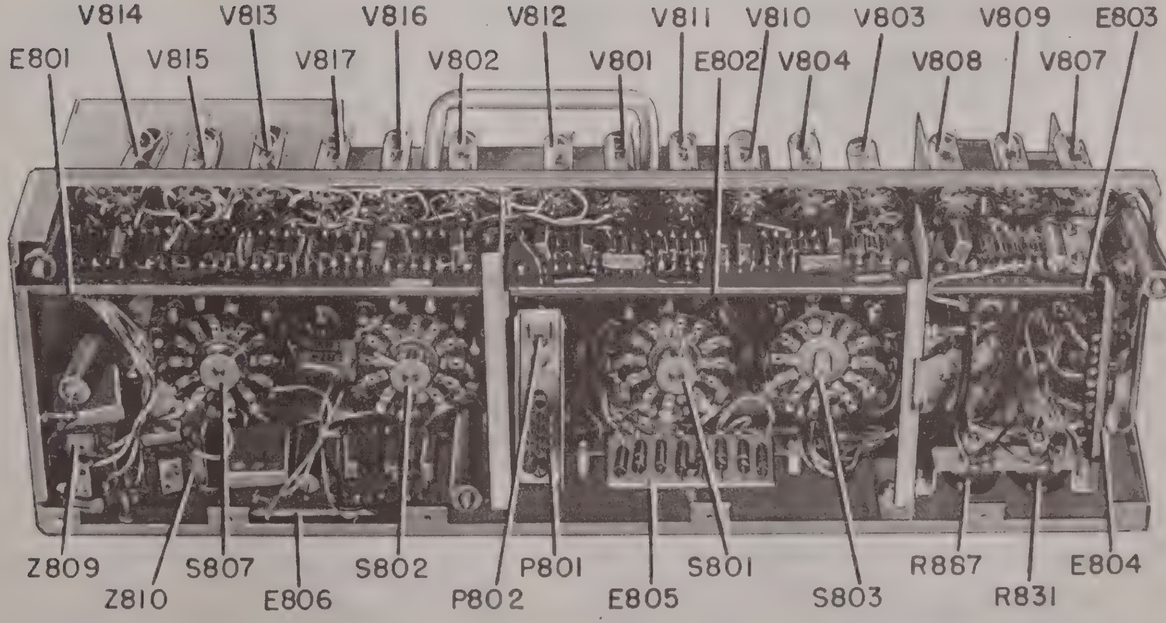

V814 V813 V816 V812 V811 V810 V803 V809 E803
E801 V815 V817 V802 V801 E802 V804 V808 V807
Z809 S807 S802 P801 S801 R867 E804
Z810 E806 P802 E805 S803 R831

Figure 14-3. Amplifier-Filter Assembly AM-775A/ARC-21, Bottom

TABLE LXXVI. TROUBLE ANALYSIS, AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 14-4

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	7* (J810)	Test Meter ME-75/ARC-21 plug cord into jack. Selective switch at position 4	Radio Set Control C-451A/ARC-21 set for "VOICE" operation, "POWER" at "HI," "CONTROL" at "ON"	+120 volts (Plate supply)	Wiring
2	7* (J810)	Selector switch at position 5	Same as step 1	+75V (Cathode bias and plate supply)	Wiring
3	7* (J810)	Selector switch at position 6	Same as step 1	27V (Fil. supply)	Wiring
4	7* (J810)	Selector switch at position 7	Same as step 1	-15 to -22V (Bias, G1 of V805)	Any tuned circuit misalignment
5	7* (J810)	Selector switch at position 8	Same as step 1	+7 to +8V (V809B cathode output)	V809B Tuned condition
6	7* (J810)	Selector switch at position 9	Same as step 1	-2.5 volts (Bias, G1 of V806)	Any tuned circuit misalignment
7	BB** (TP-M, J801)	Disconnect plug. Use insulated prod and connect clip to chassis. Selector switch at "HI IMP"	Same as step 1	-30 to -45 micro-amperes (50-kc pulse input)	Wiring
8	RR** (TP-N, J802)	Same as step 7	Same as step 1	-3 to -20 micro-amperes (Drive on V811, 450- to 900-kc amplifier)	V810 S803 coils
9	SS** (TP-P, J803)	Same as step 7	Same as step 1	-2 to -3 micro-amperes (Developed avc bias to V811)	V811 V812
10	TT** (TP-Q, J804)	Same as step 7	Same as step 1	-2 to -3 micro-amperes (Developed avc bias to V816)	V816
11	FF** (TP-R, J805)	Same as step 7	Same as step 1	-35 to -50V (G2 of V814 oscillator)	V814 S805 or crystals

TABLE LXXVI. TROUBLE ANALYSIS, AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21 (continued)

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
12	EE** (TP-S, J807)	Same as step 7	Same as step 1	-35 to -50V (G2 of V815 oscillator)	V815 S805 or crystals
13	UU** (TP-T, J807)	Same as step 7	Same as step 1	-3 to -20 microamperes (Drive on V816, 35-80-kc amplifier)	V817 S807 coils
14	VV** (TP-U, J808)	Same as step 7	Same as step 1	-25 to -35V (Drive on V817, 5-kc input)	

* Major test point. ** Minor test point.

TABLE LXXVII. VOLTAGE CHART, AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Multimeter TS-352/U. *Readings taken with VoltOhmyst.
Test Conditions: Chassis removed from unit and connected to unit by test cables.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V801	-5636	*-0.11	*1.1	21	*0	*42	27.5	*70	-
V802	-5636	* 0.04	*0.85	27.5	*-0.15	103.0	21	71	-
V803	-5636	* 0.45	1.0	6.9	0	75.8	0	77.3	-
V804	-5896	*-16.5	0	5.6	0	*-16.5	0	* 6.7	-
V805	-5636	*-66	*3.8	27.5	0	110	20.7	110	-
V806	-5840	*-39	-	27.5	0	*113.0	20.7	*34	-
V807	-6021	104.0	*-11.7	20.7	12	* 7.2	14	* 5.1	*70
V808	-5896	* 7.1	*30	8.0	-	13.2	14	* 7.1	-
V809	-6021	5	5	2.5	30	5.0	8.0	-21.3	-21.3
V810	-5840	-13.0	-	6.9	0	*108	14.2	18.3	-
V811	-5636	* -2.7	0	14.2	*-1.85	*112.0	21	23.5	-
V812	-5896	* -2.55	*8.0	6.9	0	*-2.0	14.2	*8.0	-
V813	-5636	* 0.74	-	6.9	0	90.7	0	90.7	2.3
V814	-6021	38	-36	21	0	* 3.3	27.5	0	111.0
V815	-6021	38	*-31	14.2	0	4.0	21	0	112.0
V816	-5636	* -7.2	0	21	-2.55	113.0	14.2	39.0	-
V817	-5840	12.8	0	14.2	0	110.0	6.9	20.0	-

d. Connect Signal Generator TS-413/U to minor test point CC, pin 1 of tube V810.

e. Connect a-c probe of Voltmeter TS-375/U and Frequency Meter FR-47/U to minor test point DD, pin 1 of tube V801.

f. Ground pin 4 of tube V811. This prevents the avc voltage, developed at pin 5 of tube V812, from affecting the output amplitude during alignment. Do not ground pin 5 of tube V812.

g. Turn switch S801 to rotate switch S803 until the moving contact on switch S803 engages the second stationary contact counterclockwise from the long

TABLE LXXVIII. 50-KC HARMONIC GENERATOR ALIGNMENT SETTINGS

S803 Position "Hundreds" Position	Resonate		FR-47/U Setting Kc
	on S803	on S804	
2	L833	L843	800
3	L834	L844	750
4	L835	L845	700
5	L836	L846	650
6	L837	L847	600
7	L838	L848	550
8	L839	L849	500
9	L840	L850	450

TABLE LXXIX. 5-KC HARMONIC CIRCUIT ALIGNMENT DATA

Tens Position Kc	Resonate		Frequency Meter Reading
	on S807	on S806	
60	L871	L861	65
50	L870	L860	60
40	L869	L859	55
30	L868	L858	50
20	L867	L857	45
10	L866	L856	40
0	L865	L855	35

stationary contact (chassis viewed from the bottom and the component side of terminal board E802). This is the zero position of the hundreds selector.

h. On Radio Set Control C-451A/ARC-21 set controls for "VOICE" operation, "POWER" at "LOW" and "CONTROL" to "ON."

i. Set signal generator for an indicated 900-kc, unmodulated signal. Adjust signal generator output for a reading of 0.8 volt, on the Voltmeter TS-375/U, after first adjusting inductors L831 and then L841 for maximum reading. Adjust signal generator frequency to 900 kc, as measured by the Frequency Meter FR-47/U and repeak inductors L831 and L841.

j. Rotate switch S801 to turn switch S803 counterclockwise to the next (adjacent) contact. This is the "one" position of the "hundreds" selector.

k. Set signal generator to an indicated 850 kc. Adjust inductors L832 and L842 for maximum reading on the voltmeter. Adjust signal generator to 850 kc as measured by the frequency meter. Repeak inductors L832 and L842.

l. Repeat steps j and k for each position of the "hundreds" selector, in sequence, and in accordance with table LXXVIII. Advance switches S801 and S803 counterclockwise one switch position each time.

m. Remove signal generator from minor test point CC, pin 1 of tube V810.

n. Remove voltmeter and frequency meter from pin 1 of tube V801.

o. Remove the ground from minor test point DD, pin 4 of tube V811.

14-13. UNITS AND HALVES CRYSTAL CIRCUIT ADJUSTMENT. Use the following to adjust these circuits:

a. Remove the top cover over crystals Y801 through Y809 and the bottom chassis cover. See figures 14-2 and 14-3 for reference to crystal numbers. Do not remove the fiberglass crystal oven over the crystals.

b. Connect the Amplifier-Filter Assembly AM-775A/ARC-21 to the bench setup by the test cables. The Oscillator, Radio Frequency O-180A/ARC-21 need not be in the chassis, Receiver-Transmitter MX-1424A/ARC-21 for this adjustment.

c. Check to be sure the crystals are in their proper sockets.

d. Turn on the radio set and allow a 15 minute warm-up period.

e. Connect the Multimeter ME-75/ARC-21 probe to minor test point EE (TP-S, J806). Set the multimeter to "-HI IMP" "PROBE."

f. Turn switch S805 until it engages in any one of its switch positions and adjust transformer Z810 for maximum reading on the multimeter.

NOTE

Switch S805 is rotated by turning the radial drive pin attached to the switch shaft projecting through the center of switch S807.

g. Connect the Frequency Meter FR-47/U to pin 1 of tube V813. Turn switch as in step f to the position where the frequency meter reads approximately 147 kc. Repeak transformer Z810 for a maximum reading on the multimeter.

h. Adjust capacitor C872 for a reading of precisely 147.000 kc on the frequency meter.

i. Rotate switch S805 until the frequency meter reads approximately 148 kc. Adjust capacitor C870 for a reading of precisely 148.000 kc.

j. In the same manner adjust capacitors C871, C869, and C868 for precisely 146.000 kc, 145.000 kc, and

TABLE LXXX. 600- TO 1100-KC ALIGNMENT DATA

S801 Position in Kc	Resonate	Frequency Meter Setting
200	L805	975
300	L806	925
400	L807	875
500	L808	825
600	L809	775
700	L810	725
800	L811	675
900	L812	625

TABLE LXXXI. 150- TO 200-KC BAND-PASS DATA

Switch Position S802	Resonate	Frequency Meter Setting	Check for Equal Voltage
10	L815	192.5	± 2.5 kc at all frequencies
20	L816	187.5	
30	L817	182.5	
40	L818	177.5	
50	L819	172.5	
60	L820	167.5	
70	L821	162.5	
80	L822	157.5	
90	L823	152.5	

149.000 kc respectively, after turning switch S805 to the proper position.

k. Transfer the multimeter probe to minor test point FF (TP-R, J805).

l. Connect the Frequency Meter FR-47/U to minor test point JJ, pin 4 of tube V813.

m. Rotate switch S805 until it engages in any one of its switch positions and adjust transformer Z809 for maximum reading on the multimeter.

n. Rotate switch S805 until the frequency meter reads approximately 120.000 kc. Adjust capacitor C867 for a frequency meter reading of precisely 120.000 kc.

o. Rotate switch S805 for an approximate reading of 120.250 kc. Adjust capacitor C866 for a frequency meter reading of precisely 120.250 kc.

p. In the same manner adjust capacitors C865 and C864 for precisely 120.500 kc and 120.750 kc respectively after promptly setting switch S805 each time.

q. Disconnect the multimeter from minor test point FF. Disconnect frequency meter from minor test point JJ, pin 4 of tube V813.

r. Replace outer crystal cover and frequency pointer.

14-14. 230- TO -235-KC BAND-PASS ALIGNMENT. Use the following procedure to align the 230-to-235-kc band-pass filter.

a. Connect the Amplifier-Filter Assembly, AM-775A/ARC-21 to the test setup by test cables. Remove the bottom cover.

b. Remove the Oscillator, Radio Frequency O-180A/ARC-21 entirely from the system and ground pin 4 of tube V803.

c. Connect Signal Generator TS-413/U and Frequency Meter FR-47/U to minor test point GG, pin 1 of tube V802.

d. Connect Voltmeter TS-375/U to minor test point HH, pin 1 of tube V803.

e. Connect a 4700-ohm, half-watt carbon resistor across terminals 1 and 2 of transformer Z803.

f. Set the signal generator output high enough to drive the frequency meter.

g. Adjust frequency of signal generator to precisely 232.500 kc as read on the frequency meter.

h. Adjust inductor L824, the bottom coil of transformer Z803, for maximum reading. Reduce signal generator output to keep the maximum voltmeter voltage of about 0.6 volt. It is important not to overdrive tube V802 but not necessary that the frequency meter be counting once the signal generator frequency has been accurately set.

i. Disconnect the 4700-ohm resistor previously attached to terminals 1 and 2 of transformer Z803. Connect the resistor across terminals 3 and 4 of transformer Z803.

j. Adjust inductor L825, the top coil of transformer Z803, for maximum reading on the voltmeter. Adjust the signal generator output to keep the voltmeter reading approximately 0.6 volt as tuning proceeds.

k. On completion of alignment disconnect the 4700-ohm resistor from pins 3 and 4 of transformer Z803. Disconnect the voltmeter from minor test point HH. Disconnect the signal generator and frequency meter from minor test point GG and remove the ground from minor test point JJ, pin 4 of tube V803.

14-15. 265 TO-270-KC BAND-PASS ADJUSTMENT. Align the 265-to-270-kc band-pass filter as follows:

a. Remove the Oscillator, Radio Frequency O-180A/ARC-21 entirely from the system.

b. Ground pin 4 of tube V813.

c. Connect Amplifier-Filter Assembly AM-775A/ARC-21 into the setup by test cables. Remove the bottom cover.

d. Connect the Multimeter ME-75/ARC-21 to minor test point EE (TP-S, J806) using the probe. Set the multimeter for "-HI IMP" "PROBE."

e. Rotate switch S805 to a position which gives a minimum reading on the multimeter. Switch S805 is rotated by turning the radial drive pin attached to the switch shaft projecting through the center of switch S807. This switch setting will prevent tube V815 from oscillating. Remove Multimeter ME-75/ARC-21.

f. Connect a 4700-ohm carbon resistor between pin 4 of tube V803 and ground.

g. Connect the a-c probe of Voltmeter TS-375/U to minor test point II, pin 4 of tube V803.

h. Connect the Signal Generator TS-413/U and Frequency Meter FR-47/U to pin 1 of tube V813.

i. Set signal generator output high enough to drive the frequency meter.

j. Adjust frequency of signal generator to precisely 267.500 kc as read on the frequency meter.

k. Adjust inductor L852, the bottom coil of transformer Z808, for maximum reading on the voltmeter. As turning progresses reduce the signal generator output voltage to keep this voltage at approximately 0.8 volt.

l. Remove the 4700-ohm resistor from minor test point II, pin 4 of tube V803, and ground and connect it across terminals 3 and 4 of transformer Z808.

m. Adjust inductor L851, the top coil of transformer Z808, for maximum reading on the voltmeter. Adjust signal generator output during alignment to keep this voltage approximately 0.8 volt.

n. Disconnect the 4700-ohm resistor from pins 3 and 4 of transformer Z808.

o. Disconnect voltmeter TS-375/U from minor test point II. Disconnect signal generator and frequency meter from pin 1 of V813.

p. Disconnect ground from minor test point JJ, pin 4 of tube V813.

14-16. 500-KC ALIGNMENT. Use the following procedure to align the 500-kilocycle circuits:

a. Remove the Oscillator, Radio Frequency O-180A/ARC-21 from the system.

b. Remove the bottom cover of Amplifier-Filter Assembly AM-775A/ARC-21 and connect the chassis to the system by test cables.

c. Ground pin 4 of tube V803.

d. Connect a 4700-ohm one-half watt carbon resistor between terminal 2 of transformer Z804 and ground.

e. Connect Signal Generator TS-413/U and Frequency Meter FR-47/U to minor test point HH, pin 1 of tube V803.

f. Set signal generator output high enough to drive frequency meter.

g. Adjust frequency of signal generator to precisely 500.000 kc as read on the Frequency Meter FR-47/U.

h. Connect the d-c probe for the Voltmeter TS-375/U to minor test point LL, pin 7 of tube V804.

i. Adjust inductor L828 of frequency discriminator Z805 for zero reading on the voltmeter. Then tune in direction to give a positive peak and adjust for maximum positive voltage.

j. Remove the d-c probe of the voltmeter from minor test point LL. Connect a-c probe of the voltmeter to terminal 2 of transformer Z804.

k. Adjust inductor L826, the bottom coil of transformer Z804, for maximum reading on the voltmeter. During tuning adjust signal generator output voltage to keep the voltmeter reading at approximately 3 volts.

l. Disconnect the 4700-ohm resistor from terminal 2 of transformer Z804 and connect it across terminals 3 and 4 of transformer Z804.

m. Adjust inductor L827, the top coil of transformer Z804, for a maximum reading on the voltmeter. Adjust the signal generator output voltage to keep the voltmeter reading at approximately 3 volts.

n. Remove the a-c probe of the voltmeter from terminal 2 of transformer Z804 and reconnect the d-c probe to minor test point LL, pin 7 of tube V804. Remove the 4700-ohm resistor from terminals 3 and 4 of transformer Z804.

o. Retouch the adjustment of inductor L828 for a maximum positive reading on the voltmeter. Inductor L828 is part of frequency discriminator Z805.

p. Remove the ground from pin 4 of tube V803. Remove the voltmeter, signal generator, and frequency meter.

14-17. REGENERATIVE DIVIDER AND TRIPLER ALIGNMENT. Use the following procedure:

a. Install the Oscillator, Radio Frequency O-180A/ARC-21 in the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Do not connect plug P1206 to jack J902.

b. Remove bottom cover of Amplifier-Filter Assembly AM-775A/ARC-21 and connect the chassis to the unit by test cables.

c. Ground minor test point DD, pin 1 of tube V801, minor test point OO, pin 4 of tube V802 and minor test point II, pin 4 of tube V803.

d. Connect the Signal Generator TS-413/U and the Frequency Meter FR-47/U to minor test point HH, pin 1 of tube V803. Use enough signal to drive the frequency meter. Adjust the signal generator frequency to precisely 500.000 kc as read on the frequency meter.

e. Connect the vertical input of Oscilloscope OS-8/U through approximately 10 micromicrofarads of capacitance to minor test point MM, pin 2 of tube V807.

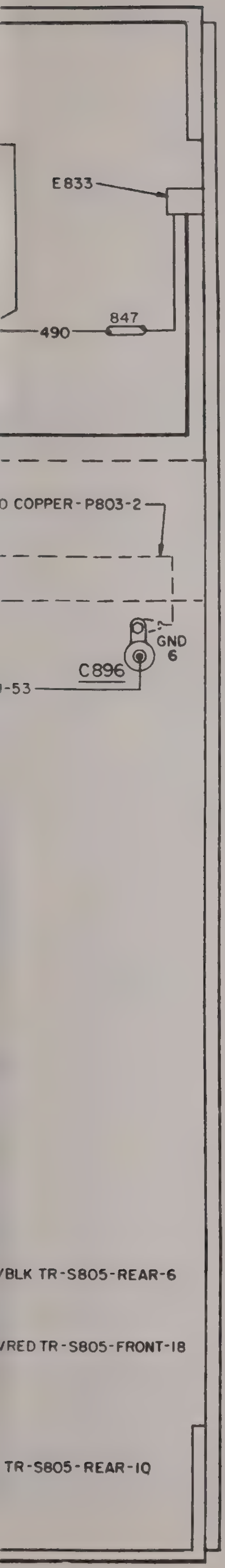
f. Set the signal generator output to 0.2 volt.

g. Adjust transformer Z807 so its tuning stud protrudes about one-fourth inch from its bushing. Adjust transformer Z806 for maximum vertical displacement on the oscilloscope. The tuning stud of transformer Z806 should protrude about three-sixteenths inch from its bushing.

h. Adjust and synchronize the internal sweep of the oscilloscope so as to display a few sine-wave cycles. Observe a notch on the leading slope of each cycle.

i. Adjust transformer Z807 to position the notch about one-third the way up the slope from the bottom of each cycle. Retouch the transformer Z806 for maximum vertical displacement of the pattern.

j. Reduce frequency of signal generator output so notch travels downward along the slope until the pattern



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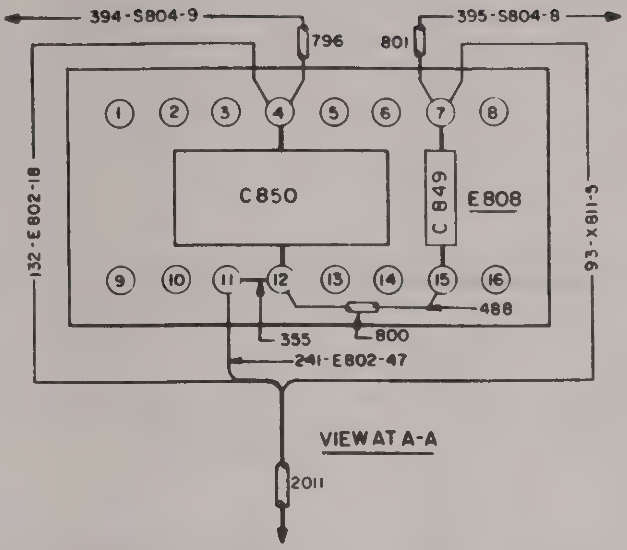
/BLK TR-S805-REAR-6
/RED TR-S805-FRONT-18
TR-S805-REAR-IQ



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C850
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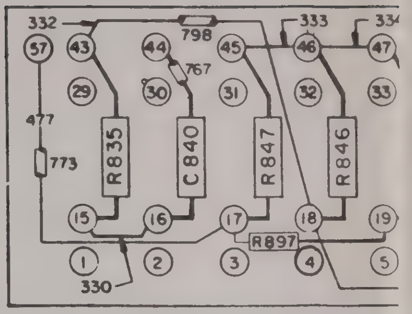

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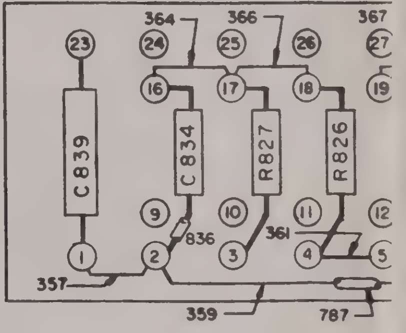

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C839
C834
R827
R826
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12
836
361
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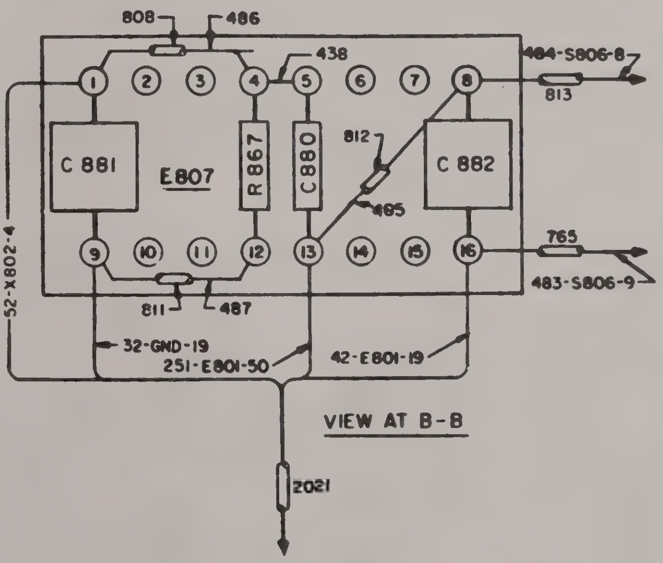
357
359
787

VIEW Y-Y



808
486
438
484-S806-8
813
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7
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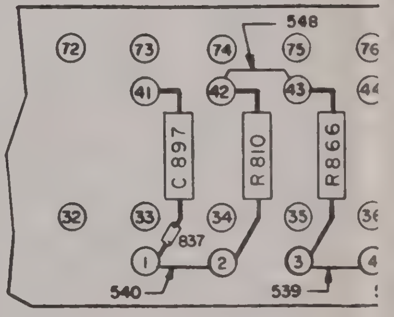
C881
E807
R867
C880
812
C882
485
52-X802-4
765
9
10
11
12
13
14
15
16
483-S806-9
811
487
32-GND-19
251-E801-50
42-E801-19
2021

VIEW AT B-B



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76
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42
43
44
C897
R810
R866
32
33
34
35
36
837
1
2
3
4
540
539

VIEW Z-Z

14-15. 265 TO-270-KC BAND-PASS ADJUSTMENT. Align the 265-to-270-kc band-pass filter as follows:

a. Remove the Oscillator, Radio Frequency O-180A/ARC-21 entirely from the system.

b. Ground pin 4 of tube V813.

c. Connect Amplifier-Filter Assembly AM-775A/ARC-21 into the setup by test cables. Remove the bottom cover.

d. Connect the Multimeter ME-75/ARC-21 to minor test point EE (TP-S, J806) using the probe. Set the multimeter for "-HI IMP" "PROBE."

e. Rotate switch S805 to a position which gives a minimum reading on the multimeter. Switch S805 is rotated by turning the radial drive pin attached to the switch shaft projecting through the center of switch S807. This switch setting will prevent tube V815 from oscillating. Remove Multimeter ME-75/ARC-21.

f. Connect a 4700-ohm carbon resistor between pin 4 of tube V803 and ground.

g. Connect the a-c probe of Voltmeter TS-375/U to minor test point II, pin 4 of tube V803.

h. Connect the Signal Generator TS-413/U and Frequency Meter FR-47/U to pin 1 of tube V813.

i. Set signal generator output high enough to drive the frequency meter.

j. Adjust frequency of signal generator to precisely 267.500 kc as read on the frequency meter.

k. Adjust inductor L852, the bottom coil of transformer Z808, for maximum reading on the voltmeter. As turning progresses reduce the signal generator output voltage to keep this voltage at approximately 0.8 volt.

l. Remove the 4700-ohm resistor from minor test point II, pin 4 of tube V803, and ground and connect it across terminals 3 and 4 of transformer Z808.

m. Adjust inductor L851, the top coil of transformer Z808, for maximum reading on the voltmeter. Adjust signal generator output during alignment to keep this voltage approximately 0.8 volt.

n. Disconnect the 4700-ohm resistor from pins 3 and 4 of transformer Z808.

o. Disconnect voltmeter TS-375/U from minor test point II. Disconnect signal generator and frequency meter from pin 1 of V813.

p. Disconnect ground from minor test point JJ, pin 4 of tube V813.

14-16. 500-KC ALIGNMENT. Use the following procedure to align the 500-kilocycle circuits:

a. Remove the Oscillator, Radio Frequency O-180A/ARC-21 from the system.

b. Remove the bottom cover of Amplifier-Filter Assembly AM-775A/ARC-21 and connect the chassis to the system by test cables.

c. Ground pin 4 of tube V803.

d. Connect a 4700-ohm one-half watt carbon resistor between terminal 2 of transformer Z804 and ground.

e. Connect Signal Generator TS-413/U and Frequency Meter FR-47/U to minor test point HH, pin 1 of tube V803.

f. Set signal generator output high enough to drive frequency meter.

g. Adjust frequency of signal generator to precisely 500.000 kc as read on the Frequency Meter FR-47/U.

h. Connect the d-c probe for the Voltmeter TS-375/U to minor test point LL, pin 7 of tube V804.

i. Adjust inductor L828 of frequency discriminator Z805 for zero reading on the voltmeter. Then tune in direction to give a positive peak and adjust for maximum positive voltage.

j. Remove the d-c probe of the voltmeter from minor test point LL. Connect a-c probe of the voltmeter to terminal 2 of transformer Z804.

k. Adjust inductor L826, the bottom coil of transformer Z804, for maximum reading on the voltmeter. During tuning adjust signal generator output voltage to keep the voltmeter reading at approximately 3 volts.

l. Disconnect the 4700-ohm resistor from terminal 2 of transformer Z804 and connect it across terminals 3 and 4 of transformer Z804.

m. Adjust inductor L827, the top coil of transformer Z804, for a maximum reading on the voltmeter. Adjust the signal generator output voltage to keep the voltmeter reading at approximately 3 volts.

n. Remove the a-c probe of the voltmeter from terminal 2 of transformer Z804 and reconnect the d-c probe to minor test point LL, pin 7 of tube V804. Remove the 4700-ohm resistor from terminals 3 and 4 of transformer Z804.

o. Retouch the adjustment of inductor L828 for a maximum positive reading on the voltmeter. Inductor L828 is part of frequency discriminator Z805.

p. Remove the ground from pin 4 of tube V803. Remove the voltmeter, signal generator, and frequency meter.

14-17. REGENERATIVE DIVIDER AND TRIPLER ALIGNMENT. Use the following procedure:

a. Install the Oscillator, Radio Frequency O-180A/ARC-21 in the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Do not connect plug P1206 to jack J902.

b. Remove bottom cover of Amplifier-Filter Assembly AM-775A/ARC-21 and connect the chassis to the unit by test cables.

c. Ground minor test point DD, pin 1 of tube V801, minor test point OO, pin 4 of tube V802 and minor test point II, pin 4 of tube V803.

d. Connect the Signal Generator TS-413/U and the Frequency Meter FR-47/U to minor test point HH, pin 1 of tube V803. Use enough signal to drive the frequency meter. Adjust the signal generator frequency to precisely 500.000 kc as read on the frequency meter.

e. Connect the vertical input of Oscilloscope OS-8/U through approximately 10 micromicrofarads of capacitance to minor test point MM, pin 2 of tube V807.

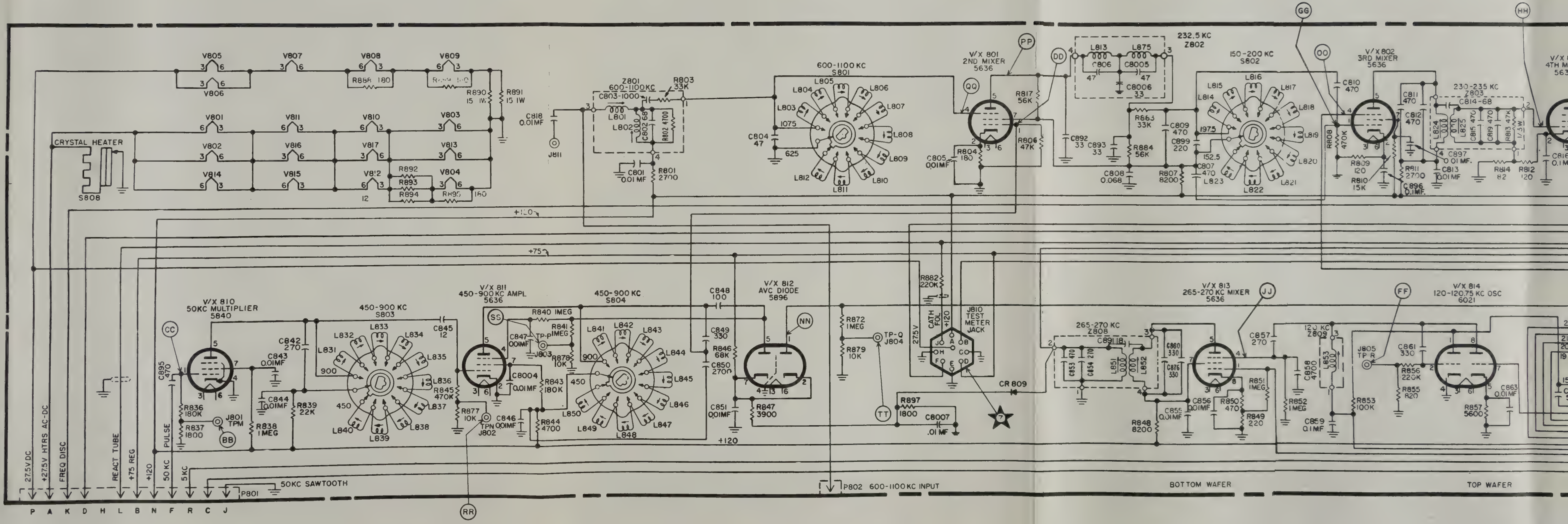
f. Set the signal generator output to 0.2 volt.

g. Adjust transformer Z807 so its tuning stud protrudes about one-fourth inch from its bushing. Adjust transformer Z806 for maximum vertical displacement on the oscilloscope. The tuning stud of transformer Z806 should protrude about three-sixteenths inch from its bushing.

h. Adjust and synchronize the internal sweep of the oscilloscope so as to display a few sine-wave cycles. Observe a notch on the leading slope of each cycle.

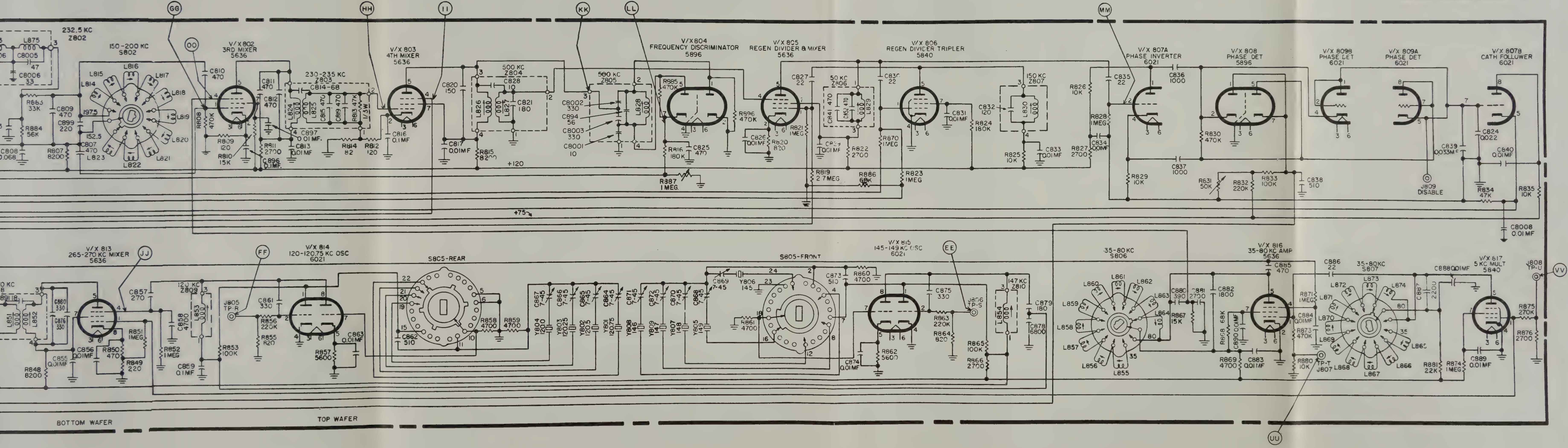
i. Adjust transformer Z807 to position the notch about one-third the way up the slope from the bottom of each cycle. Retouch the transformer Z806 for maximum vertical displacement of the pattern.

j. Reduce frequency of signal generator output so notch travels downward along the slope until the pattern


V805
V807
V808
V809
V806
R888 180
R890 15 IW
R891 15 IW
V801
V811
V810
V803
V802
V816
V817
V813
V814
V815
V812
V804
R892
R893
R894
R895 160
CRYSTAL HEATER
S808
C818 0.01MF
J811
Z801 600-1100KC
C803-1000
R803 33K
L801
L802
C802 68
R802 4700
C801 0.01 MF
R801 2700
+120
+75
600-1100 KC S801
L803
L804
L805
L806
L807
L808
L809
L810
L811
L812
1075
625
C804 47
V/X 801 2ND MIXER 5636
PP
QQ
DD
R817 56K
R806 47K
R804 180
C805 .001MF
C892 33
C893 33
L813
L875
C806 47
C8005 47
C8006 33
232.5 KC Z802
R663 33K
R884 56K
C808 0.068
C809 470
C899 220
R807 8200
C807 470
150-200 KC S802
L814
L815
L816
L817
L818
L819
L820
L821
L822
L823
1975
152.5
GG
OO
C810 470
V/X 802 3RD MIXER 5636
R808 470K
R809 120
R810 15K
R811 2700
C896 0.1MF.
C811 470
C812 470
230-235 KC Z803
C814-68
L824
L825
C815 470
C819 470
R813 47K 1/2W
C897 0.01 MF.
C813 .001MF
R814 82
R812 120
HH
V/X 4TH M 563
V/X 810 50KC MULTIPLIER 5840
CC
C895 470
R836 180K
R837 1800
J801 TPM
BB
C843 .001MF
C844 .001MF
R838 1MEG
R839 22K
C842 270
450-900 KC S803
L831
L832
L833
L834
L835
L836
L837
L838
L839
L840
900
450
C845 12
V/X 811 450-900 KC AMPL 5636
SS
R840 1MEG
C847 .001MF
TP-P J803
R841 1MEG
R878 10K
C8004 .001MF
R843 180K
R845 470K
R877 10K
TPN J802
C846 .001MF
R844 4700
RR
450-900 KC S804
L841
L842
L843
L844
L845
L846
L847
L848
L849
L850
C848 100
C849 330
R846 68K
C850 2700
C851 .001MF
V/X 812 AVC DIODE 5896
NN
R847 3900
+120
R872 1MEG
R879 10K
TP-Q J804
TT
R897 1800
C8007 .01 MF
R882 220K
275V
CATH FOL
J810 TEST METER JACK
CR 809
265-270 KC Z808
C853 470
C854 270
C891 18
L851
L852
C860 330
C876 330
V/X 813 265-270 KC MIXER 5636
JJ
C857 270
R851 1MEG
R850 470
R849 220
C856 .001MF
C855 0.01MF
R848 8200
R852 1MEG
C858 4700
120 KC Z809
L853
C859 0.1MF
FF
J805 TP-R
C861 330
R856 220K
R855 820
R853 100K
V/X 814 120-120.75 KC OSC 6021
R857 5600
C863 0.01MF
27.5V DC
+27.5V HTRS AC-DC
FREQ DISC
REACT TUBE
+75 REG
+120
PULSE
50 KC
5 KC
50KC SAWTOOTH
P801
P802 600-1100KC INPUT
BOTTOM WAFER
TOP WAFER
P
A
K
D
H
L
B
N
F
R
C
J

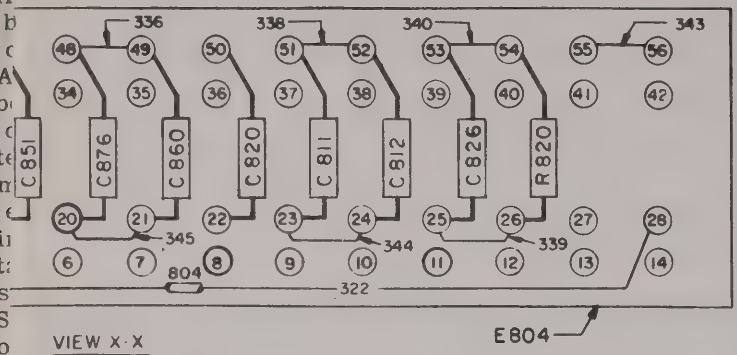
NOTE 1:
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

NOTE 2:
ALL CAPACITOR VALUES IN MMF UNLESS OTHERWISE SHOWN.



232.5 KC Z802
150-200 KC S802
V/X 802 3RD MIXER 5636
230-235 KC Z803
V/X 803 4TH MIXER 5636
500 KC Z804
500 KC Z805
V/X 804 FREQUENCY DISCRIMINATOR 5896
V/X 805 REGEN DIVIDER & MIXER 5636
50 KC Z806
V/X 806 REGEN DIVIDER TRIPLER 5840
150 KC Z807
V/X 807A PHASE INVERTER 6021
V/X 808 PHASE DET 5896
V/X 809B PHASE DET 6021
V/X 809A PHASE DET 6021
V/X 807B CATH FOLLOWER 6021
J809 DISABLE
+120
+75
V/X 813 265-270 KC MIXER 5636
120 KC Z809
V/X 814 120-120.75 KC OSC 6021
J805 TP-R
S805-REAR
S805-FRONT
V/X 815 145-149 KC OSC 6021
J806 TP-S
147 KC Z810
35-80 KC S806
V/X 816 35-80 KC AMP 5636
35-80 KC S807
V/X 817 5 KC MULT 5840
J808 TP-U
TP-T J807
BOTTOM WAFER
TOP WAFER
GG
HH
II
KK
LL
MM
OO
JJ
FF
EE
UU
VV

Figure 14-4. Amplifier-Filter Assembly AM-775A/ARC-21, Schematic Diagram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42
C851
C876
C860
C820
C811
C812
C826
R820
20
21
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23
24
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345
344
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12
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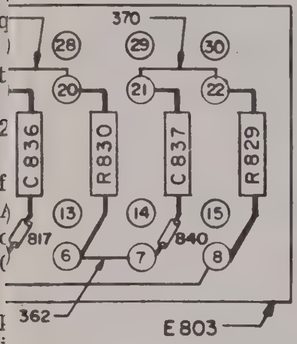
14
804
322
E804

VIEW X-X

TED 90° CLOCKWISE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C836
R830
C837
R829
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14
15
817
840
6
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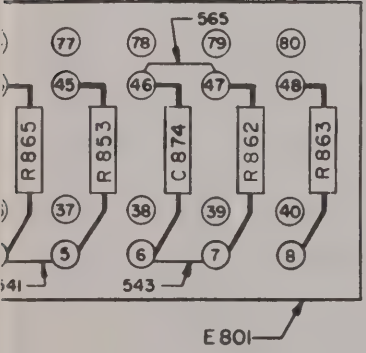
8
362
E803


565
77
78
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80
45
46
47
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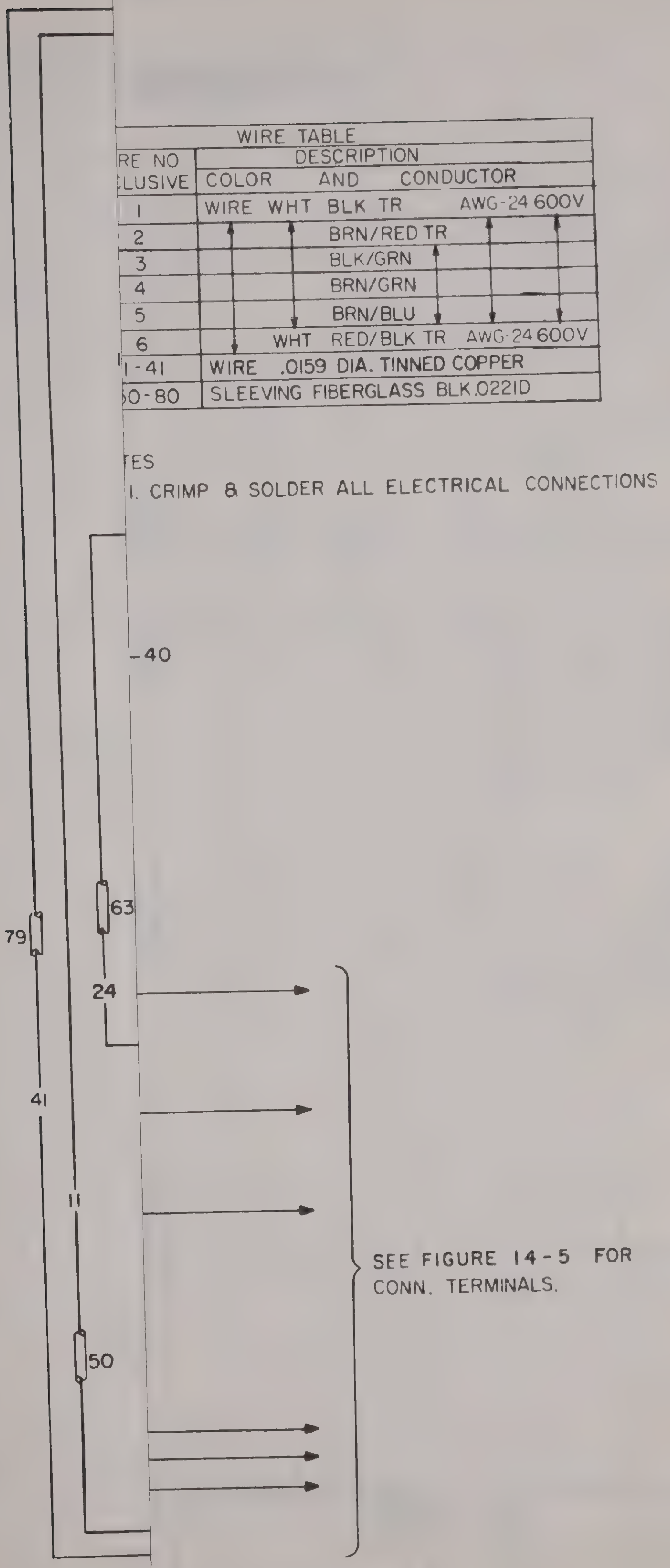
R865
R853
C874
R862
R863
37
38
39
40
5
6
7
8
541
543
E801

WIRE TABLE	
WIRE NO'S INCLUSIVE	DESCRIPTION WIRE AND CONDUCTOR
1-5	WIRE WHITE BRN TR AWG 24 600V
11-12	BLK/BRN TR
21-23	BRN/RED TR
31-33	BLK/GRN TR
41-42	BRN/GRN TR
51-52	YEL TR
61-62	BRN/BLU TR
81 83	RED/GRN TR
91-95	BLU TR
101-107	RED/BLU TR
111-112	YEL/BLK TR
121-122	YEL/RED TR
131-132	YEL/GRN TR
141-142	GRN/BLK TR
151	GRN/BRN TR
161-162	GRN/RED TR
171	BLU/BRN TR
181-182	BLU/BLK TR
191	BRN/ORN TR
201	BRN/YEL TR
212	RED TR
221-222	YEL/BLU TR
241	GRN/ORN TR
251	GRN/YEL TR
261	ORN TR
271-272	GRN TR
275	WIRE WHITE BLK TR AWG 24 600V
281-284	WIRE WHITE BRAIDED
231-577	WIRE TINNED COPPER .0159 DIA.
601-617	SLEEVING INSUL BRN .052 O.D
620-630	RED
640-651	YEL
660-674	BLU
685-692	VIO
700-715	GRN
735-848	BLK
860-877	WHT
890-896	SLEEVING INSUL GRY .052 O.D
900	CABLE
950-953	SLEEVING INSUL BLK .066 I.D
2011	SLEEVING INSUL BLK .106 I.D
2021	SLEEVING INSUL BLK .133 I.D

NOTE

1. RUN THESE WIRES OUTSIDE OF CABLE.



RE NO LUSIVE	DESCRIPTION COLOR AND CONDUCTOR
	WIRE TABLE
1	WIRE WHT BLK TR AWG-24 600V
2	↕ ↕ BRN/RED TR ↕ ↕
3	BLK/GRN ↕
4	BRN/GRN
5	BRN/BLU
6	WHT RED/BLK TR AWG-24 600V
1-41	WIRE .0159 DIA. TINNED COPPER
0-80	SLEEVING FIBERGLASS BLK.022ID

TES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

SEE FIGURE 14-5 FOR CONN. TERMINALS.

nbly, Connection Diagram

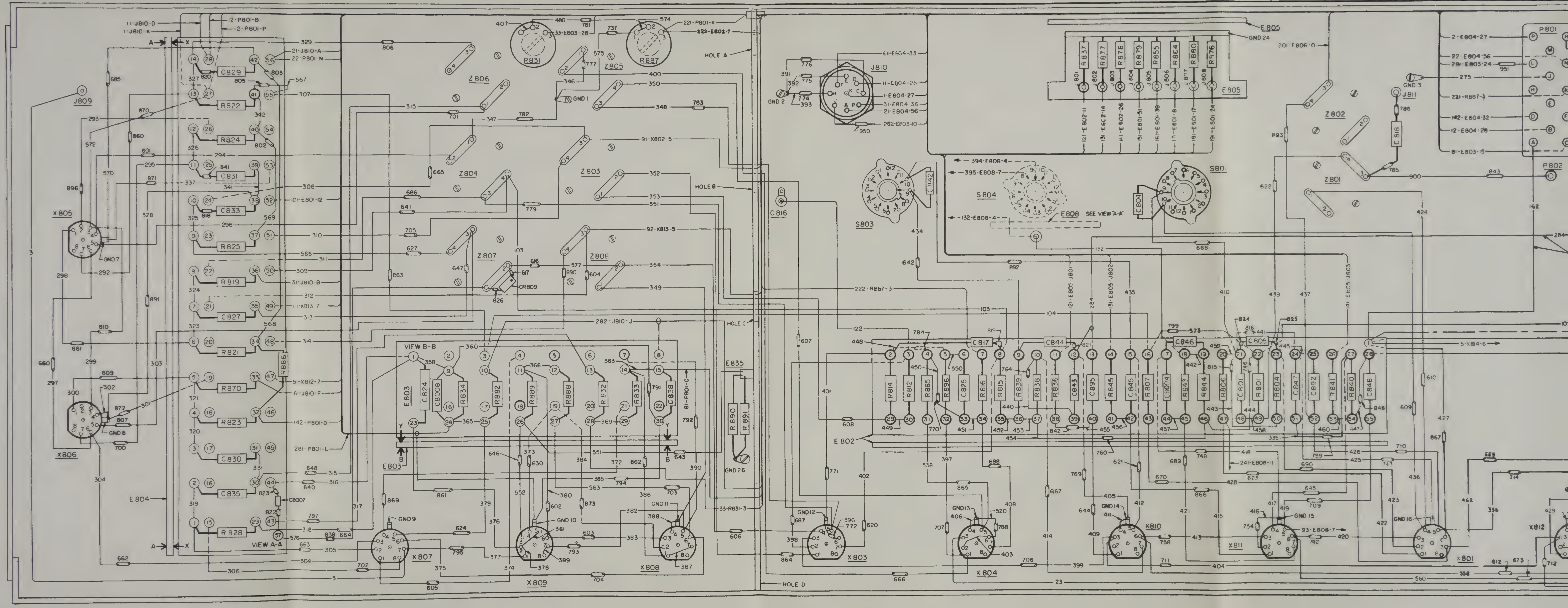
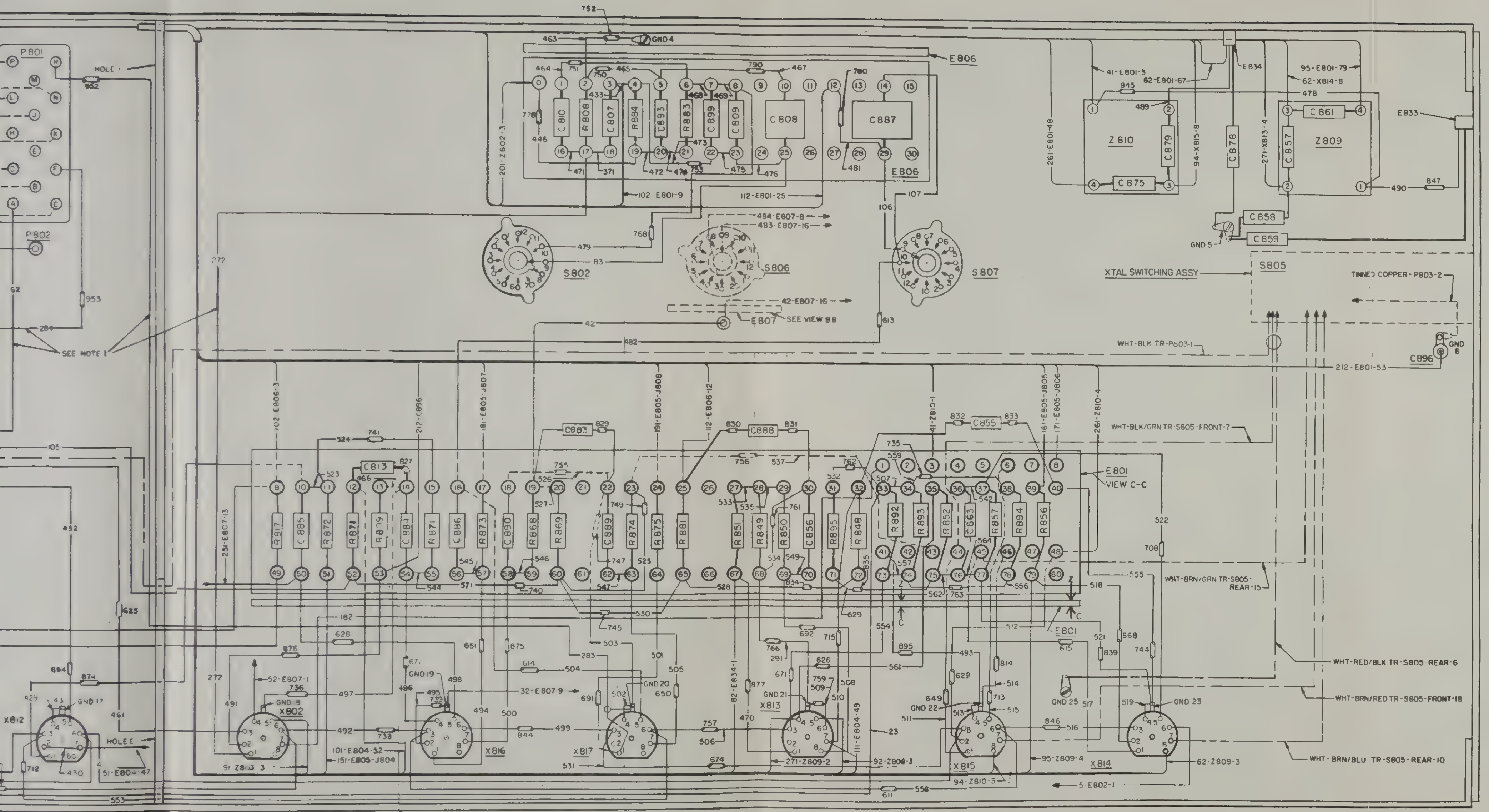

J809
X805
X806
E804
VIEW A-A
C829
R822
R824
C831
C833
R825
R819
C827
R821
R870
R823
C830
C835
R828
R886
C8007
Z806
Z804
Z807
Z805
Z803
Z808
R831
R887
GND 1
HOLE A
HOLE B
HOLE C
HOLE D
CR809
VIEW B-B
E803
C824
C8008
R834
R882
R889
R888
R832
R833
C838
X807
X808
X809
GND 9
GND 10
GND 11
E835
R890
R891
GND 26
C816
J810
GND 2
S803
S804
E808
SEE VIEW "A-A"
C842
S801
C804
E805
GND 24
R837
R877
R878
R879
R855
R864
R880
R476
Z802
Z801
J811
C818
GND 3
P801
P802
C817
C844
C846
C805
E802
R814
R812
R885
R896
C825
R816
R815
R839
R838
R836
C843
C895
R845
C845
R807
C8074
R843
R844
R806
CR801
R801
R804
C847
C892
R841
R840
C848
X803
X804
X810
X811
X801
X812
GND 12
GND 13
GND 14
GND 15
GND 16

Figure 14-5. Amplifier-Filter Assembly AM-775A/ARC-21, Connection Diagram


P801
P802
E806
E834
E833
Z810
Z809
C808
C887
S802
S806
S807
E807 SEE VIEW BB
XTAL SWITCHING ASSY
S805
TINNED COPPER-P803-2
WHT-BLK TR-P803-1
212-E801-53
C896
GND 6
GND 4
GND 5
E801 VIEW C-C
WHT-BLK/GRN TR-S805-FRONT-7
WHT-BRN/GRN TR-S805-REAR-15
WHT-RED/BLK TR-S805-REAR-6
WHT-BRN/RED TR-S805-FRONT-18
WHT-BRN/BLU TR-S805-REAR-10
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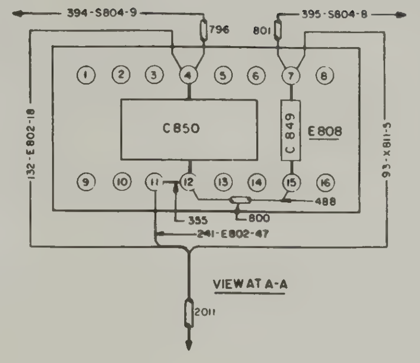
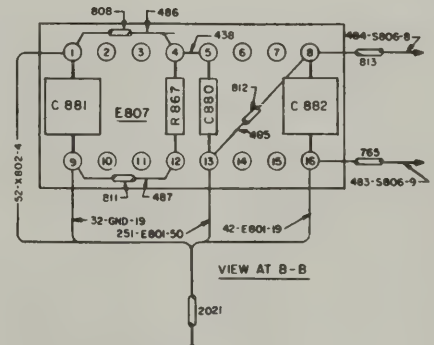
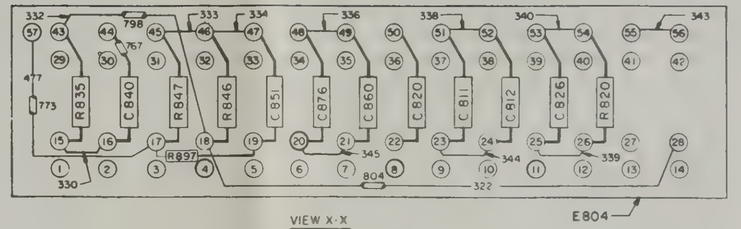
X816
X817
X813
X815
X814
X812
HOLE E
HOLE 1
SEE NOTE 1
5-E802-1


394-S804-9
395-S804-8
C850
E808
C849
241-E802-47
2011

VIEW AT A-A

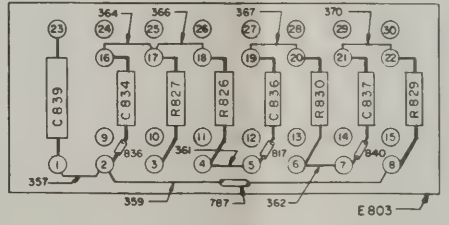

C881
E807
R867
C880
C882
484-S806-8
483-S806-9
32-GND-19
251-E801-50
42-E801-19
2021

VIEW AT B-B

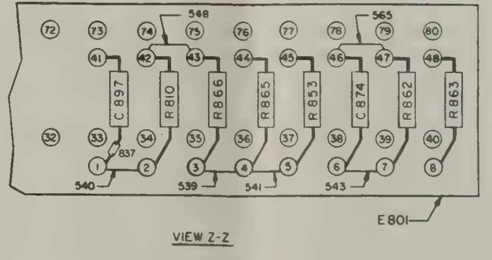

R835
C840
R847
R846
C851
C876
C860
C820
C811
C812
C826
R820
E804

VIEW X-X

ROTATED 90° CLOCKWISE


C839
C834
R827
R826
C836
R830
C837
R829
E803

VIEW Y-Y


C897
R810
R866
R865
R853
C874
R862
R863
E801

VIEW Z-Z

NOTE

1. RUN THESE WIRES OUTSIDE OF CABLE.

WIRE TABLE	
WIRE NO'S INCLUSIVE	DESCRIPTION WIRE AND CONDUCTOR
5	WIRE WHITE BRN TR AWG 24 600V
11 12	BLK/BRN TR
21-23	BRN/RED TR
31-33	BLK GRN TR
41 42	BRN/GRN TR
51-52	YEL TR
61-62	BRN/BLU TR
81 83	RED/GRN TR
91 95	BLU TR
101-107	RED/BLU TR
111 112	YEL/BLK TR
121-122	YEL/RED TR
131-132	YEL/GRN TR
141-142	GRN/BLK TR
151	GRN/BRN TR
161-162	GRN/RED TR
171	BLU/BRN TR
181 182	BLU/BLK TR
191	BRN/ORN TR
201	BRN/YEL TR
212	RED TR
221-222	YEL/BLU TR
241	GRN/ORN TR
251	GRN/YEL TR
261	ORN TR
271-272	GRN TR
275	WIRE WHITE BLK TR AWG 24 600V
281 284	WIRE WHITE BRAIDED
231-877	WIRE TINNED COPPER .0159 DIA
601-617	SLEEVING INSUL BRN .052 O.D
620-630	RED
640-651	YEL
660-674	BLU
685-692	VIO
700-715	GRN
735-848	BLK
860-877	WHT
890-896	SLEEVING INSUL GRY .052 O.D
900	CABLE
950-953	SLEEVING INSUL BLK .066 I.D
2011	SLEEVING INSUL BLK .106 I.D
2021	SLEEVING INSUL BLK .133 I.D

WIRE TABLE	
WIRE NO INCLUSIVE	DESCRIPTION
	COLOR AND CONDUCTOR
1	WIRE WHT BLK TR AWG-24 600V
2	BRN/RED TR
3	BLK/GRN
4	BRN/GRN
5	BRN/BLU
6	WHT RED/BLK TR AWG-24 600V
11-41	WIRE .0159 DIA. TINNED COPPER
50-80	SLEEVING FIBERGLASS BLK.022ID

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

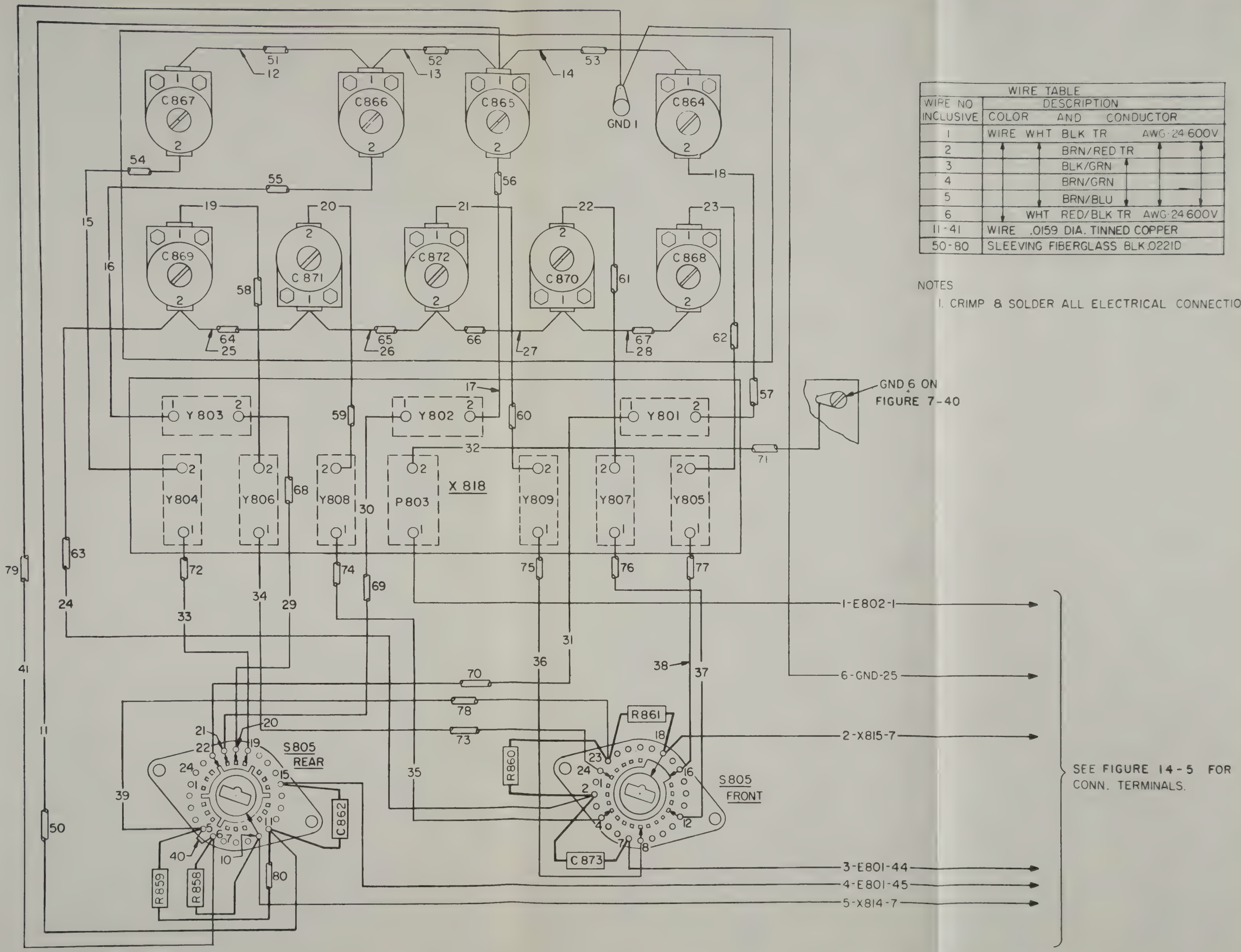

C867
C866
C865
C864
GND 1
C869
C871
C872
C870
C868
Y803
Y802
Y801
Y804
Y806
Y808
P803
X 818
Y809
Y807
Y805
GND 6 ON FIGURE 7-40
S805 REAR
S805 FRONT
R861
R860
C873
C862
R859
R858
1-E802-1
6-GND-25
2-X815-7
3-E801-44
4-E801-45
5-X814-7
SEE FIGURE 14-5 FOR CONN. TERMINALS.

Figure 14-6. Crystal Switching Assembly, Connection Diagram

TABLE LXXXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21 (continued)

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
4. 265-270 kc Band Pass Adjustment	14-15	--	--	--	ME-75/ARC-21	J806 TP-S	Max. Voltage	Adjust S805.
		TS-413/U FR-47/U	V813-1	267.500 kc	TS-375/U	V803-4	Max. Voltage	Adjust L852, L851.
5. 500 kc Alignment	14-16	TS-413/U FR-47/U	V803-1	500.000 kc	TS-375/U	V804-7	Max. Positive Voltage	Adjust L828.
						Z804-2	Max. Voltage	Adjust L826, L827.
						V804-7	Max. Positive Voltage	Retouch L828.
6. Regenerative Divider and Tripler Alignment	14-17	TS-413/U FR-47/U	V803-1	500.000 kc	OS-8/U	V807-2	Max. Vertical Displacement on Scope	Adjust Z806. Adjust Z807 to position notch in leading slope of each cycle about one-third from bottom.
				500.000 kc±				Adjust Z807 so scope pattern drops out of synchronization at approximately equal frequencies above and below 500.000 KC.
7. 5 KC Harmonic Generator Alignment	14-18	Bench Test Setup			FR-47/U TS-375/U	V802-4 V812-1	Max. Voltage	Adjust L865-L871, L855-L861 at frequencies indicated in table LXXIX.
8. 600-1100 KC Alignment	14-19	TS-413/U FR-47/U	J902	See table LXXX	TS-375/U FR-47/U	V801-5	Max. Voltage	Adjust L803, L801, L805-L812 at frequencies indicated in table LXXX.
9. 150-200 KC Alignment	14-20	TS-413/U FR-47/U	V801-4	232.5 kc	TS-375/U	Z805-3	Min. Voltage	Adjust Z802.
				See table LXXI		V802-1	Max. Voltage	Adjust L814-L825 at frequencies indicated in table LXXXI. Check for equal voltages ±2.5 kc at all frequencies.

TABLE LXXXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
Chassis, components	Dents, cracks, bent pins, stripped threads, dirt, dust, corrosion, discoloration, burned or deteriorated insulation.

II. ALIGNMENT

		IN			OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. 50 KC Harmonic Generator Alignment	14-12	TS-413/U	V810-1	900 kc	TS-375/U FR-47/U	V801-1	Max Voltage 900 kc	Controls for "VOICE" operation, "LOW" power, "CONTROL" to "ON". Adjust L831, L841, decrease input in 50 KC steps and adjust L833-L840, L843-L850. (See table LXXVIII.)
2. Units and Halves Crystal Circuit Adjustment	14-13	Bench Test Setup			FR-47/U	V813-1	147 kc	
					ME-75/ARC-21	J806 TP-S	Max. Voltage 148.000 kc 146.000 kc 145.000 kc 149.000 kc	Adjust C870, C871, C869, C868 for precise frequency.
					ME-75/ARC-21	J805 TP-R	Max. Voltage	Adjust Z809.
					FR-47/U	V813-1	120.000 kc 120.250 kc 120.500 kc 120.750 kc	Adjust C867, C866, C865, C864 for precise frequency.
3. 230-235 kc Band Pass Adjustment	14-14	75-413/U FR-47/U	V802-1	232.500 kc	TS-375/U	V803-1	Max. Voltage	Adjust L824, L825.

TABLE LXXXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21 (continued)

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
4. 265-270 kc Band Pass Adjustment	14-15	--	--	--	ME-75/ARC-21	J806 TP-S	Max. Voltage	Adjust S805.
		TS-413/U FR-47/U	V813-1	267.500 kc	TS-375/U	V803-4	Max. Voltage	Adjust L852, L851.
5. 500 kc Alignment	14-16	TS-413/U FR-47/U	V803-1	500.000 kc	TS-375/U	V804-7	Max. Positive Voltage	Adjust L828.
						Z804-2	Max. Voltage	Adjust L826, L827.
						V804-7	Max. Positive Voltage	Retouch L828.
6. Regenerative Divider and Tripler Alignment	14-17	TS-413/U FR-47/U	V803-1	500.000 kc	OS-8/U	V807-2	Max. Vertical Displacement on Scope	Adjust Z806. Adjust Z807 to position notch in leading slope of each cycle about one-third from bottom.
				500.000 kc±				Adjust Z807 so scope pattern drops out of synchronization at approximately equal frequencies above and below 500.000 KC.
7. 5 KC Harmonic Generator Alignment	14-18	Bench Test Setup			FR-47/U TS-375/U	V802-4 V812-1	Max. Voltage	Adjust L865-L871, L855-L861 at frequencies indicated in table LXXIX.
8. 600-1100 KC Alignment	14-19	TS-413/U FR-47/U	J902	See table LXXX	TS-375/U FR-47/U	V801-5	Max. Voltage	Adjust L803, L801, L805-L812 at frequencies indicated in table LXXX.
9. 150-200 KC Alignment	14-20	TS-413/U FR-47/U	V801-4	232.5 kc	TS-375/U	Z805-3	Min. Voltage	Adjust Z802.
				See table LXXI		V802-1	Max. Voltage	Adjust L814-L825 at frequencies indicated in table LXXXI. Check for equal voltages ±2.5 kc at all frequencies.

TABLE LXXXII. MAINTENANCE CHECK LIST FOR AMPLIFIER-FILTER ASSEMBLY AM-775A/ARC-21 (continued)

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
10. R831 Adjustment	14-21	--	--	--	ME-75/ ARC-21	J201	6.5V	Adjust R831.
11. R887 Adjustment	14-22	Receiver Scan			--	--	Transfer from scan to tune	Turn R887 counterclockwise until transfer occurs.

barely maintains synchronism. Record the signal generator frequency.

k. Increase the signal generator frequency above 500 kc until the pattern barely maintains synchronism. The drop-out points should be the same amount above and below 500 kc, approximately 485 kc and 515 kc.

l. If the above condition is not obtained, repeat steps d and i. Recheck as in steps j and k.

m. Remove the grounds from minor test point DD, pin 1 of tube V801, minor test point OO, pin 4 of tube V802, and minor test point II, pin 4 of tube V803.

n. Remove signal generator and oscilloscope.

14-18. 5-KC HARMONIC GENERATOR ALIGNMENT. With the chassis cabled into the test setup, remove bottom cover and top cover and proceed as follows:

a. Ground pin 4 of tube V816. Do not connect plug P1206 to jack J902.

b. Connect Voltmeter TS-375/U to minor test point NN, pin 1 of tube V812. Use the d-c probe and set voltmeter to the appropriate scale.

c. Connect Frequency Meter FR-47/U to minor test point OO, pin 4 of tube V802.

d. Set the controls on Radio Set Control C-451A/ARC-21 for "VOICE" operation, "POWER" at "LOW," and "CONTROL" to "ON."

e. Turn the radial driving pin on switch S802 to rotate switch S807, the "tens" selector, clockwise to the 80-kc position. The movable contact on switch S807 will engage the stationary contact spaced one unit clockwise from the long stationary contact.

f. Adjust inductor L874 on switch S807 and inductor L864 on switch S806 for maximum reading on the voltmeter. The frequency meter should indicate 80 kc.

g. Advance switch S802 to turn switch S807 clockwise by one switch position putting the "tens" selector into the 75-kc position.

h. Adjust inductors L873 on switch S807, and L863 on switch S806 for maximum reading on the voltmeter. The frequency meter should read 75 kc. The "tens" selector is in the 70-kc position.

i. Advance switch S802 to turn switch S807 clockwise one switch position.

j. Adjust inductor L872 on switch S807, and inductor L862 on switch S806, for a maximum reading on the voltmeter. The frequency meter should read 70 kc.

k. Repeat steps i and j for each of the remaining positions of the "tens" selector in sequence, as given in table LXXIX, advancing switches S802 and S807 clockwise by one switch position each time.

l. Remove ground from pin 4 of tube V816.

m. Remove voltmeter and frequency meter.

14-19. 600-TO-1100-KC ALIGNMENT. Make the following alignment if the 600-to-1100-kc circuits are suspected of trouble:

a. Remove the bottom and top center covers from the chassis.

b. Connect the Amplifier-Filter Assembly AM-775A/ARC-21 chassis in the system by means of test cables. Use a short piece of unshielded lead to connect plug P802 to jack J1212 if transformer Z801 is to be trimmed.

c. Do not connect plug P1206 and jack J902. Connect Signal Generator TS-413/U and Frequency Meter FR-47/U to jack J902.

d. Connect a-c probe of TS-375/U to minor test point PP, pin 5 of tube V801.

e. Ground pin 1 of V811.

f. Turn switch S801 until the moving contact engages the second stationary contact counterclockwise from the long stationary contact. The "hundreds" selector is now in the zero-kc position.

g. Set the signal generator output high enough to drive the frequency meter. Adjust the signal generator frequency to 1075 kc as read on the frequency meter.

h. Adjust inductor L803 of switch S801 for maximum reading on the voltmeter. Keep the signal generator output level adjusted to give an output reading of about 0.8 volts.

i. In a similar way adjust inductor L801, the top core of transformer Z801.

j. Advance switch S801 counterclockwise by one switch position. The "hundreds" selector switch is now in the 100-kc position.

k. Set signal generator output high enough to drive the frequency meter and adjust the signal generator frequency to 1025 kc, as read on the frequency meter.

l. Adjust inductor L804 on switch S801 for maximum reading on the voltmeter. Adjust signal generator output level so the voltmeter reading will be approximately 0.8 volt.

m. Repeat steps j, k, and l using the data in table LXXX as a guide.

n. After the 625-kc adjustment (tuning inductor L812) tune inductor L802, the bottom core of transformer Z801, for maximum reading on the voltmeter. During this adjustment use an output level from the signal generator to give a voltmeter reading of 0.8 volt.

o. Remove the ground from pin 1 of tube V811.

p. Remove the signal generator, frequency meter, and voltmeter.

14-20. 150-TO-200-KC ALIGNMENT INCLUDING 232.5-KC REJECTION ALIGNMENT. It is assumed that transformers Z803, Z804, Z805, Z808, Z809 and Z810 are already aligned. Proceed as follows:

a. Remove bottom and top center covers.

b. Connect the Amplifier-Filter Assembly AM-775A/ARC-21 into the system by test cables.

c. Ground pin 4 of V802 and pin 1 of V811.

d. Connect Signal Generator TS-413/U and Frequency Meter FR-47/U to minor test point QQ, pin 4 of tube V801. Set the signal generator for 0.5-volt output and 232.5 kilocycles as read on the frequency meter.

e. Connect the Voltmeter TS-375/U (a-c probe) to minor test point KK, pin 3 of frequency discriminator Z805.

f. On the Radio Set Control C-451A/ARC-21 set the controls for "VOICE" operation, "POWER" to "LOW" and "CONTROL" at "ON."

g. Set the "tens" switch, S802, to zero position by tuning the switch so its movable contact engages the stationary contact two positions counterclockwise from the long stationary contact.

h. Set the "units" switch, S805, as indicated by the pointer on top of the outer cover of the crystal compartment, to the 5.0 position.

i. Adjust transformer Z802 for minimum indication on the voltmeter.

j. Disconnect the voltmeter from test point KK, pin 3 of tube V805 and, using the a-c probe connected to minor test point GG, pin 1 of tube V802.

k. Set the signal generator to 197.5 kc as checked by the frequency meter.

l. Resonate inductor L814 for maximum indication. Adjust signal generator output to keep voltmeter reading about 0.7 volt as tuning progresses.

m. Check voltage on voltmeter with signal generator set at 195 and 200 kc. These voltages should be equal. If they are not, retouch tuning in the indicated direction to make them equal.

n. Repeat steps k, l, and m for the remaining nine positions of switch S802 using the data in table LXXXI.

o. Remove grounds from pin 4 of tube V802 and pin 1 of tube V811.

p. Disconnect signal generator, frequency meter, and voltmeter.

14-21. ADJUSTMENT OF RESISTOR R831. This is a final adjustment which should be made whenever a particular Amplifier-Filter Assembly AM-775A/ARC-21 chassis is installed in a system in which it was not last used. Proceed as follows:

a. Disconnect plug P1206 from jack J902.

b. Turn the equipment on.

c. Connect plug of Multimeter ME-75/ARC-21 into major test point 8, jack J201, located in Relay Assembly RE-134A/ARC-21.

d. Set switch of multimeter to position 8.

e. Adjust resistor R831 for a reading of 6.5 volts being read on the 15-volt scale.

f. Reconnect plug P1206 and remove multimeter.

14-22. ADJUSTMENT OF RESISTOR R887. This is a final operational adjustment and should never be made unless the equipment will not transfer from scan to tune during the receiver tune cycle.

a. Reduce the 27.5-volt d-c source voltage to 24 volts and select a frequency of 5000 kilocycles.

b. While the receiver is scanning turn resistor R887, in a counterclockwise direction, from the clockwise end until transfer from scan to tune is accomplished. Proceed slowly. Do not turn this control farther in a counterclockwise direction than is necessary to accomplish the transfer from scan to tune.

SECTION XV

MAINTENANCE INSTRUCTIONS FOR OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21

15-1. GENERAL.

15-2. This chassis contains a stabilized 500-kc reference oscillator and locked in oscillators, with mixers to develop 900-kc, 500-kc, 50-kc and 5-kc outputs. It also contains a harmonic generator which develops 3 mc to 13.5 mc in 500-kc steps. The output of the "thousands" harmonic generator circuit is fed to a mixer in the chassis. The mixer also gets a signal from the Amplifier-Oscillator AM-776A/ARC-21. The difference or output frequency is in the region of 600 to 1100 kc.

15-3. TROUBLE ANALYSIS.

15-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

15-5. Examine the unit carefully for visible damage or signs of overheated components. Check any suspected items and replace if necessary.

15-6. Before connecting the chassis in the test bench setup, check the resistance between the plug pins and ground and the tube pins and ground as given in tables LXXXIII and LXXXIV respectively.

15-7. Connect the chassis into the test setup by means of test cables, making certain all coaxial connectors are cabled into the system and check as described in table LXXXV.

15-8. Circuit components may be checked when necessary by reference to voltage and resistance charts given in tables LXXXVI and LXXXV and LXXXIV respectively. When drive is lacking at a given test point, and tubes and circuits check satisfactorily, the circuits require adjustment or alignment as described in paragraphs 15-12 through 15-21.

15-9. ALIGNMENT, ADJUSTMENT, AND CHECKS.

15-10. GENERAL. Paragraphs 15-12 through 15-21 describe alignment, adjustment, and checking procedures for Oscillator, Radio Frequency O-180A/ARC-21.

15-11. Table LXXXVIII is a maintenance check list summarizing maintenance procedures for this component. It lists preliminary inspection procedures, tabulates all alignment and adjustments, and lists tests that will assure field maintenance personnel that a repaired Oscillator, Radio Frequency O-180A/ARC-21 meets minimum acceptable standards of performance. Table LXXXVIII may also be used as a guide in the preparation of a maintenance check list by field maintenance personnel and to establish a maintenance history of the component.

15-12. DIVIDER CIRCUIT ALIGNMENT.

15-13. Remove the bottom cover and connect the chassis in the bench test setup by means of test cables. Turn the equipment on and proceed as follows:

a. Use Voltmeter TS-375/U with d-c probe and set to the -30-volt range. A voltage reading of from -16 to -24 volts at minor test point X, pin 2 of V902A, will indicate that the 500-kilocycle reference oscillator V901 is operative.

b. Connect the high-impedance probe of Multimeter ME-75/ARC-21 to minor test point T, TP-F, and set the meter selector switch to "-HI IMP." Adjust inductor L903 for maximum output. Note the indication and leave the multimeter connected.

c. Measure frequency of reference oscillator Y901 by connecting Frequency Meter FR-47/U to plug P904. On completion of check disconnect frequency meter and replace cable connecting plug P904 and jack J1215.

d. Set the Signal Generator TS-413/U to exactly 100 kc, using the Frequency Meter FR-47/U.

NOTE

> If a Frequency Meter FR-47/U is not available, use the 500-kc reference oscillator in this chassis as a standard. This applies only if the reference oscillator is believed to be reasonably accurate. Connect Signal Generator TS-413/U to the horizontal input of Oscilloscope OS-8/U. Adjust the signal generator to the 100-kc reading on the dial. Connect plug P904 of the chassis being checked to the vertical input of the oscilloscope. Adjust the oscilloscope controls for a pattern of convenient size and totally contained on the face of the oscilloscope tube. Slightly adjust the frequency of the signal generator until a stationary Lissajous figure of 5-to-1 ratio appears. Disconnect the oscilloscope from plug P904 of this chassis. The signal generator has been tuned to 100 kc, as standardized by the reference oscillator on the chassis being checked.

15-14. ADJUSTMENT OF TRANSFORMER Z902. Proceed as follows:

a. Connect vertical plates of oscilloscope through a one-half megohm resistor to pin 8 of tube V902 and ground.

b. Connect the horizontal plates of the oscilloscope to the signal generator.

c. Connect minor test point X, pin 2 of tube V902, to ground.

d. Adjust the controls of the oscilloscope to form a pattern.

e. Adjust the core of transformer Z902 for a 1-to-1 pattern. This pattern will not necessarily stand still.

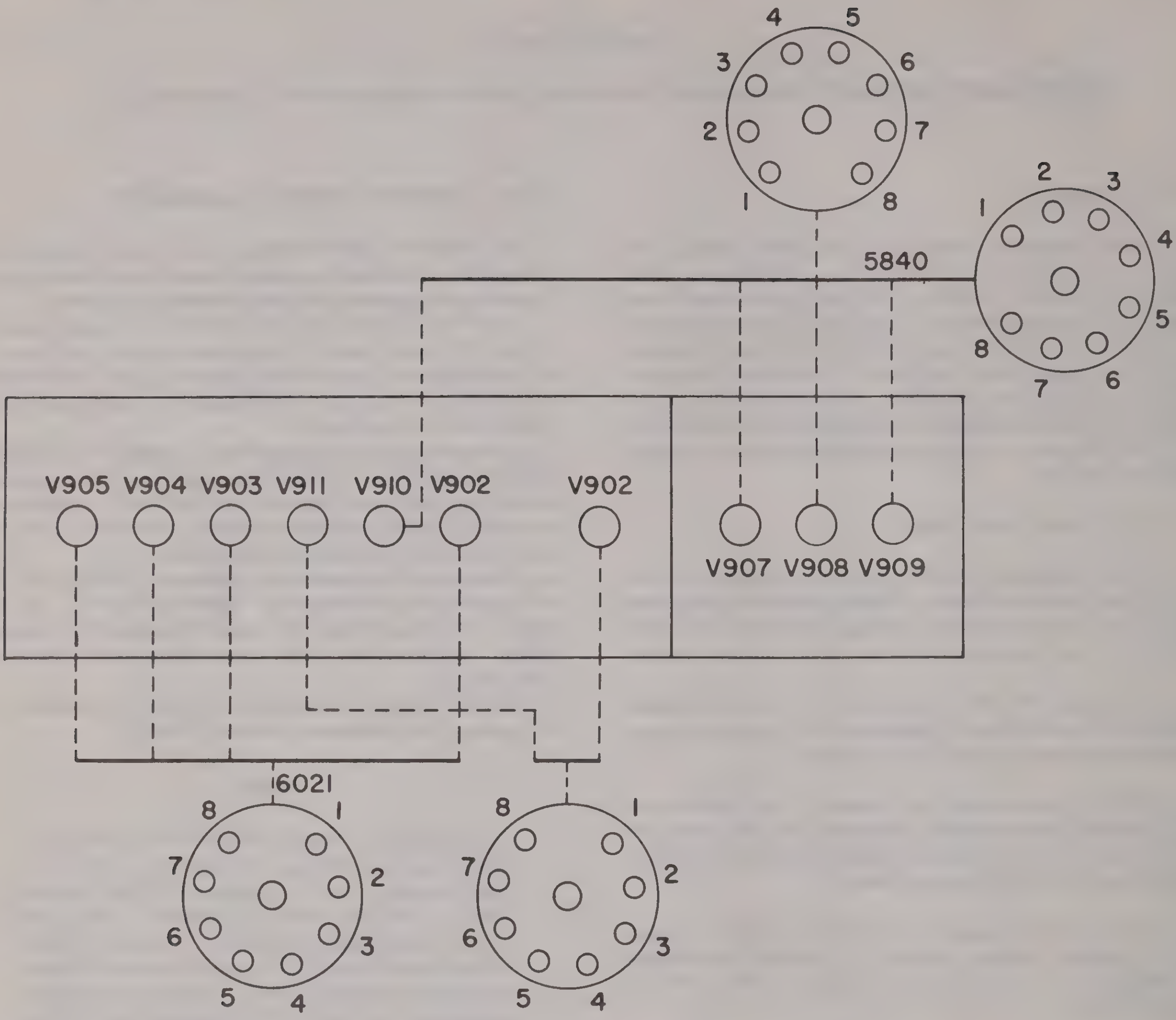


Figure 15-1. Oscillator, Radio Frequency O-180A/ARC-21, Tube Location

f. Remove the ground connection from minor test point X, pin 2 of tube V902. Do not disturb the setting of the signal generator, since it will be used for further test.

15-15. ADJUSTMENT OF TRANSFORMER Z903. Proceed as follows:

a. Connect pin 7 of tube V902 to ground.

b. Connect vertical input of oscilloscope to pin 5 of tube V904 and ground.

c. Connect signal generator, as previously adjusted to 100 kc, to the horizontal input of the oscilloscope.

d. Adjust the core of transformer Z903 for a 2-to-1 pattern on the oscilloscope screen. This pattern will not necessarily stand still.

15-16. CHECKING LOCK-IN. To check the 500-kc lock-in range proceed as follows:

a. Remove the connection between pin 7 of tube V902 and ground.

b. Disconnect lead from pin 7 of socket X912 and connect signal generator to this lead. Do not dismount the crystal oscillator. Set the signal generator to give a 500-kc unmodulated signal.

c. Adjust the generator output voltage until the same indication is obtained on the meter as in step b, paragraph 15-13.

d. Connect the oscilloscope vertical plates to pin 5 of tube V904 and ground.

e. Adjust the oscilloscope controls to obtain a Lissajous figure of 10-to-1. Vary the frequency of the signal generator below 500 kc until the signal falls out of lock, as seen on the oscilloscope. Record the frequency and increase the frequency until it locks in and again record the frequency.

f. Vary the signal generator above 500 kc until the signal drops out of lock and then decrease the frequencies until the signal locks in again. Record the frequencies. Dropout should not occur between the frequencies 490 and 510 kilocycles. If the frequencies are not symmetrical, touch up transformers Z902 and Z903.

g. Transfer the vertical input of the oscilloscope, through a 180,000-ohm resistor, to minor test point Y, pin 1 of tube V904A. Adjust the oscilloscope controls to get a stationary 50-to-1 Lissajous figure.

h. Check lock-in range as given in e. If the lock-in range is narrower than in step e, replace tube V904.

TABLE LXXXIII. RESISTANCE IN OHMS, PLUG P901 TO GROUND

Condition: Chassis removed from unit, all cables disconnected.

Pin	A	B	C	D	E	F	H	J	K
Reading	100 meg	69k	14	*	*	-	10.8	-	-
Pin	L	M	N	P	R				
Reading	5600	0	0	*	*				

*Infinite resistance value.

TABLE LXXXIV. RESISTANCE CHART, OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21

All resistances in ohms, k = 1000. Measured to ground.
Readings taken with Multimeter TS-352/U.
Test Conditions: Chassis removed from unit, all cables disconnected.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V901 (X912)	-5840	0	3.7	*	69k	10.8	1080	112.5k	-
V902A/B	-6021	100 meg	105k	3.2	0	0	0	50k	73k
V903A/B	-6021	104k	102k	5.7	0	7000	3.3	*	70.8k
V904A/B	-6021	77k	**	8.2	0	6000	5.8	925k	91k
V905A/B	-6021	112k	100k	9.9	0	12500	8.2	950k	169k
V906	-5636	1 meg	780	3.5	1 meg	100 meg	0	100 meg	-
V907	-5840	220k	0	7.5	-	100 meg	3.8	40.8k	-
V908	-5896	*	18k	7.4	0	-	10.5	*	-
V909	-5840	302k	0	7.2	-	100 meg	3.6	100 meg	0
V910	-5840	*	0	10.6	-	100 meg	14.3	464k	-
V911	-5636	120k	0	10.5	112k	100 meg	14.2	100 meg	-

*Infinite resistance value.
**0 to 1 meg depends on adjustment of R919.

TABLE LXXXV. TROUBLE ANALYSIS, OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 15-4

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	6* (J901)	Plug Multimeter ME-75/ARC-21 into jack. Selector switch at position 4	Radio Set Control C-451A/ARC-21 set for "VOICE" operation, "POWER" at "HI " "CONTROL" at "ON"	+120 volts (Plate supply)	Open or broken wiring
2	6* (J901)	Selector switch at position 5	Same as step 1	40 volts (Grid 2, pin 7 voltage, 900-kc mixer, V911)	
3	6* (J901)	Selector switch at position 6	Same as step 1	48 volts (Plate voltage 50-kc osc, V903A)	V903A
4	6* (J901)	Selector switch at position 7	In receive position only	-20 volts receive (Disabling for 500-kc doubler, V910)	Wiring

TABLE LXXXV. TROUBLE ANALYSIS, OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21 (continued)

Step	Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
5	6* (J901)	Selector switch at position 9	Same as step 1	4.8 volts (Cathode bias 600- to 1100-kc mixer, V906)	
6	T** (TP-F)	Disconnect Plug. Test Meter ME-75/ ARC 21. Insulated probe, clip on chassis. Selector switch to "-HI IMP"	Same as step 1	33 to 50 micro-amperes (500-kc drive on G1, pin 1, of V909)	V901, V902A
7	U** (TP-I)	Same as step 6	Same as step 1 Key down	18 to 30 micro-amperes (1000-kc drive on G3, pin 4, of V911)	V910
8	V** (TP-J)	Same as step 6	Same as step 1 Key down	9 to 15 micro-amperes (100-kc drive on pin 1 of V911)	V901, V902, V903B
9	W** (TP-K)	Same as step 6	Same as step 1	25 to 50 micro-amperes (50-kc drive on pin 7 of V904B)	
10	W** (TP-L)	Same as step 6	Same as step 1	18 to 30 micro-amperes (5-kc drive on pin 7 of V905B)	

*Major test point.
**Minor test point.

TABLE LXXXVI. VOLTAGE CHART, OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21

All voltages dc to ground except where otherwise noted.
Readings taken with Multimeter TS-352/U. *Readings taken with VoltOhmyst.
Test Condition: Chassis connected into test bench setup with test cables.

Tube		Pin Number							
Symbol	Type	1	2	3	4	5	6	7	8
V901 (X912)	-5840								
V902A/B	-6021	*50	*-20	6.6	0	0	0	*-5.0	*60
V903A/B	-6021	*50	*-6.0	13.0	0	0	6.6	-18.4	75.0
V904A/B	-6021	*63	*-6.9	20.0	0	*5	13.0	*-27	55
V905A/B	-6021	47	*-9.1	26.0	0	4.6	20.0	*-15	36.4
V906	-5636	*1.78	4.0	6.4	0	115.0	0	106.0	-
V907	-5840	*-0.38	0	13.5	-	*110.0	+6.4	*+40	-
V908A/B	-5896	*-0.3	*+2.74	+13.5	0	*+0.08	19.8	+2.5	-
V909	-5840	*-30	0	13.5	-	112.0	6.4	44.8	0
V910	-5840	-18.7	0	19.8	-	120.0	26.0	*34	-
V911	-5636	-0.15	0	19.8	*-0.08	119.5	26.0	33.6	-
X912	(ref osc)		6.4	0	75.0	26.0	-0.025	*-21	-

TABLE LXXXVII. ALIGNMENT CHART, SWITCHES S901 AND S902

Megacycle Position	Resonate	Nominal Frequency in Mc
21	L910-L933	12.5
20	L911-L934	12
19	L912-L935	11.5
18	L913-L936	11
17	L914-L937	10.5
16	L915-L938	10
15	L916-L939	9.5
14	L917-L940	9
13	L918-L941	8.5
12	L919-L942	8
11	L920-L943	7.5
10	L921-L944	7
9	L922-L945	6.5
8	L923-L946	6
7	L924-L947	5.5
6	L925-L948	5
5	L926-L949	4.5
4	L927-L950	4
3	L928-L951	3.5
2	L929-L952	3

i. Transfer vertical oscilloscope input to minor test point Z, pin 5 of tube V905. Adjust the oscilloscope controls to obtain a stationary 100-to-1 Lissajous figure. Check lock-in range as in step e. If lock-in range is less, replace tube V905.

j. Reconnect wire previously removed from pin 7 of socket X912.

15-17. ADJUSTMENT OF TRANSFORMERS Z906, Z907, and Z908. Complete the alignment of the divider circuits as follows:

a. Connect the Multimeter ME-75/ARC-21 probe to minor test point U, jack J910, TP-I, and the multimeter clip to ground. Ground pins D and E of plug P901. Adjust the inductors L953 and L954 of transformer Z906 for peak indication.

b. Transfer the multimeter probe to minor test point V, J911, TP-J and adjust inductor L957 of Z908 for maximum meter indication.

c. Connect the a-c probe of the Voltmeter TS-375/U to minor test point AA, terminal 2 of transformer Z907. Adjust inductors L955 and L956 of transformer Z907 for peak output.

15-18. ADJUSTMENT OF ASSOCIATED TRANSFORMERS EXTERNAL TO THE OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21. When any adjustments are made to transformer Z907 the associated circuits in the Amplifier-Oscillator AM-776A/ARC-21 should also be aligned. Proceed as follows:

a. Connect the vertical input of the Oscilloscope OS-8/U to minor test point M, pin 1 of tube V509, in the Amplifier-Oscillator AM-776A/ARC-21 chassis.

b. Connect the horizontal input of the oscilloscope to minor test point BB, jack J904.

c. Tune transformer T507, in Amplifier-Oscillator AM-776A/ARC-21 for a 9-to-5 Lissajous figure on the oscilloscope and a single peak.

d. Remove oscilloscope and connect the a-c probe of Voltmeter TS-375/U to minor test point M, pin 1 of tube V509. Retune transformer T507 for maximum indication on the voltmeter.

e. Repeak transformers Z906, Z907, Z908 and T507. Voltmeter should indicate between 0.9 and 1.75 volts.

15-19. This completes the alignment of the frequency divider circuits. Disconnect the test equipment.

15-20. THOUSANDS HARMONIC GENERATOR ALIGNMENT, OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21.

15-21. With the stabilized oscillator V901 and buffer V902A known to be operating correctly, the harmonic generator for 3-to-13.5 mc may be adjusted as follows:

a. Connect the Multimeter ME-75/ARC-21 high impedance probe to minor test point T, TP-F, jack J909. Adjust inductor L903 for maximum meter indication.

b. Attach the a-c probe of Voltmeter TS-375/U to TP-G, jack J908. Disconnect the coaxial cables from jack J902 and plug P903.

c. Connect Frequency Meter FR-47/U to plug P903.

d. Set switches S901 and S902 at the 23-mc position. The 23-mc position, looking at the switch rear, is the first counterclockwise switch contact from the long stator contact. Set the moving contact on this switch contact.

e. Adjust inductors L908 and L931 for maximum meter indication at approximately 13.5 mc, as indicated by Frequency Meter FR-47/U.

f. The maximum meter indication should be a value between 0.44 and 0.66 volt rms. A typical level with the switch settings given is 0.52 volt rms.

g. Rotate switches S901 and S902 counterclockwise

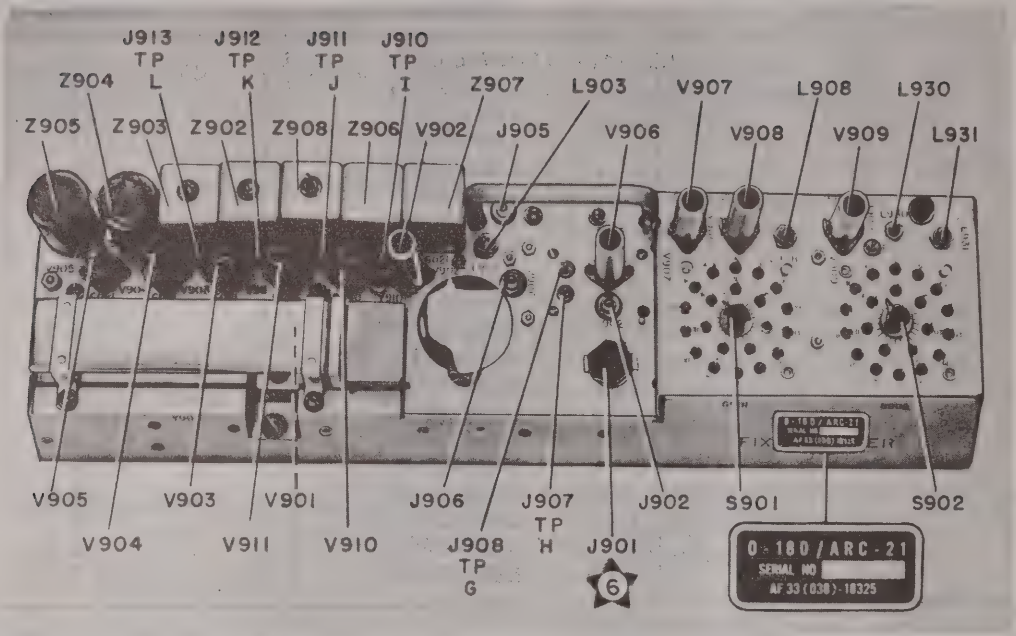

J913 TP L
J912 TP K
J911 TP J
J910 TP I
Z904
Z907
L903
V907
L908
L930
Z905
Z903
Z902
Z908
Z906
V902
J905
V906
V908
V909
L931
V905
V903
V901
J906
J907 TP H
J902
S901
S902
V904
V911
V910
J908 TP G
J901
6
O-180/ARC-21
SERIAL NO
AF 33 (038)-18325

Figure 15-2. Oscillator, Radio Frequency O-180A/ARC-21, Top

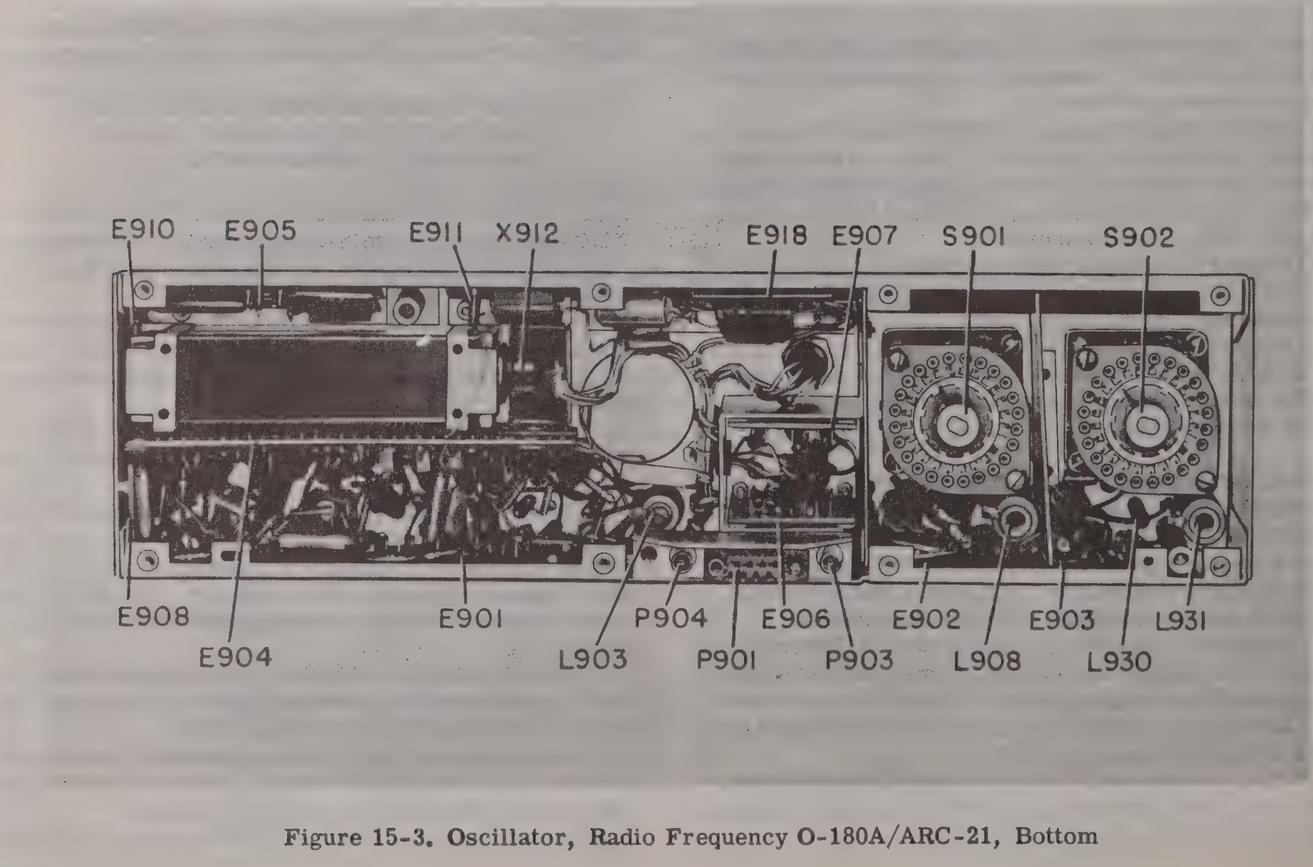

E910
E905
E911
X912
E918
E907
S901
S902
E908
E904
E901
L903
P904
P901
E906
P903
E902
L908
E903
L930
L931

Figure 15-3. Oscillator, Radio Frequency O-180A/ARC-21, Bottom

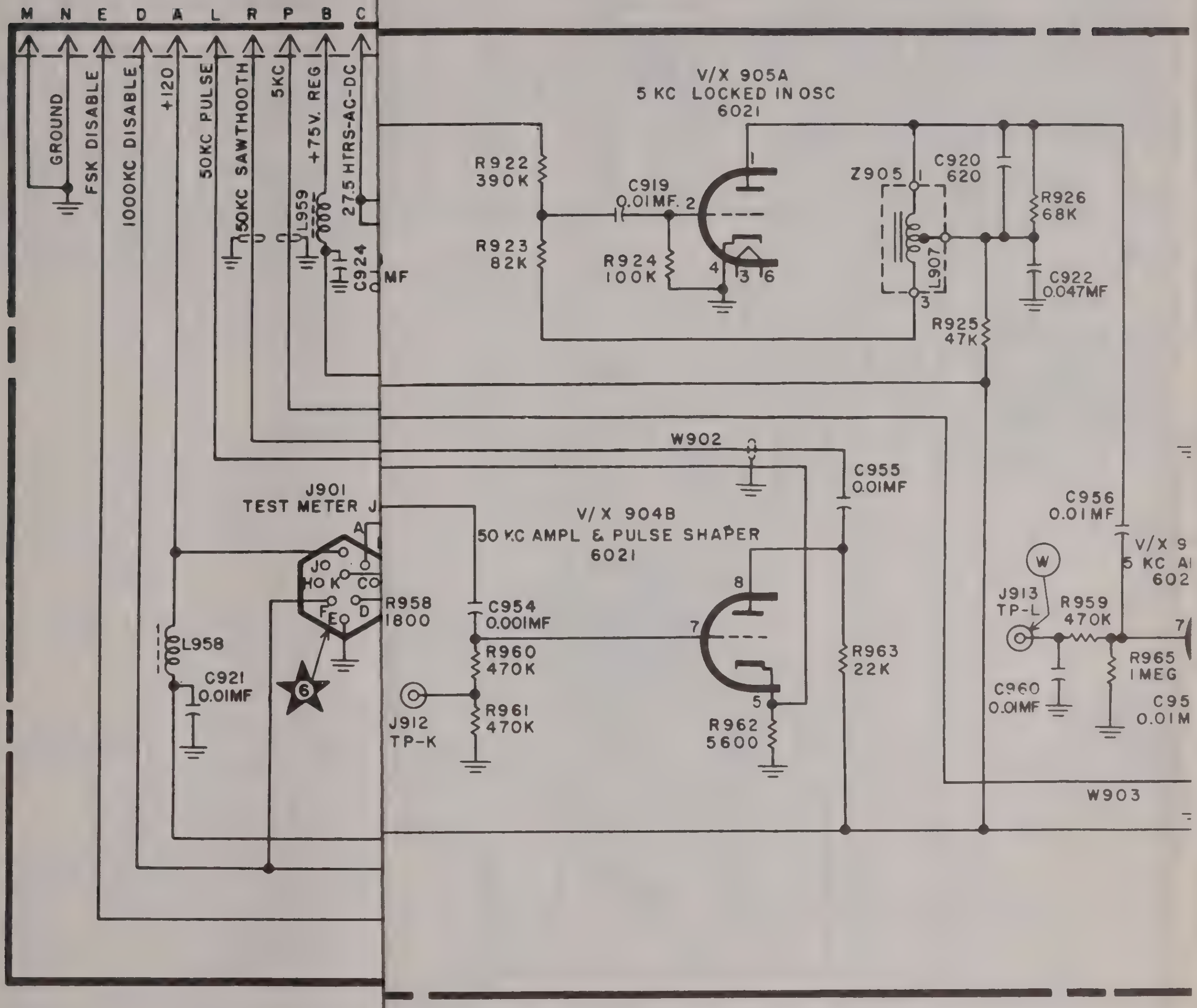
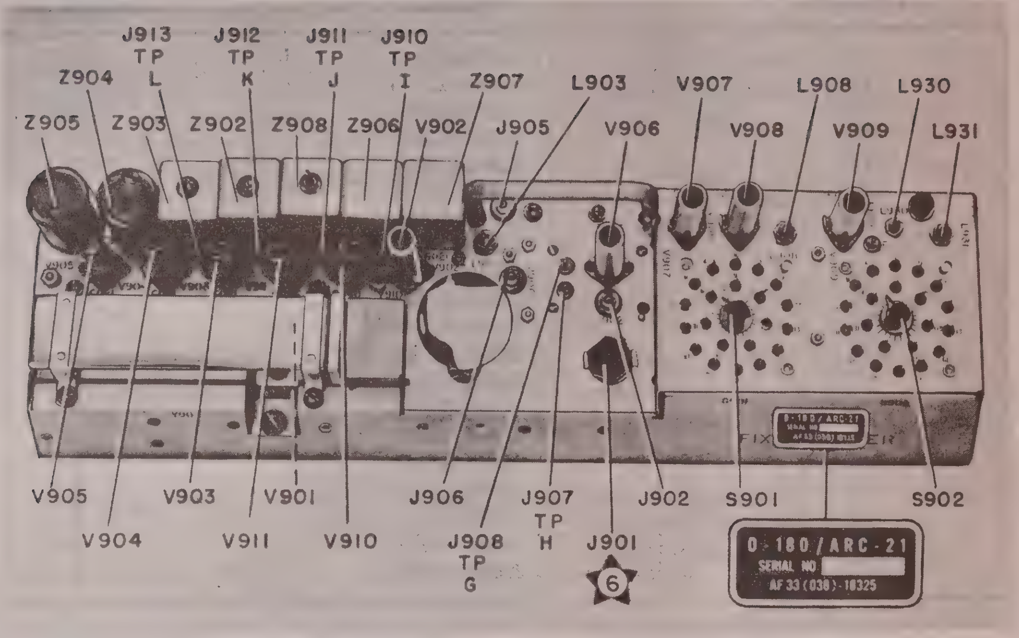

M N E D A L R P B C
GROUND
FSK DISABLE
1000KC DISABLE
+120
50KC PULSE
50KC SAWTOOTH
5KC
+75V. REG
27.5 HTRS-AC-DC
50KC
L959
C924
MF
V/X 905A
5 KC LOCKED IN OSC
6021
R922
390K
R923
82K
C919
0.01MF.
R924
100K
Z905
L907
C920
620
R926
68K
C922
0.047MF
R925
47K
W902
C955
0.01MF
J901
TEST METER J
V/X 904B
50 KC AMPL & PULSE SHAPER
6021
JO
HO K
CO
F E D
A
R958
1800
C954
0.001MF
R960
470K
R961
470K
J912
TP-K
L958
C921
0.01MF
6
R963
22K
R962
5600
C956
0.01MF
V/X 9
5 KC A
602
W
J913
TP-L
R959
470K
R965
1MEG
C960
0.01MF
C95
0.01M
W903

Figure 15-4. Oscillator, Radi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J912 TP K
J911 TP J
J910 TP I
Z904
Z907
L903
V907
L908
L930
Z905
Z903
Z902
Z908
Z906
V902
J905
V906
V908
V909
L931
V905
V903
V901
J906
J907 TP H
J902
S901
S902
V904
V911
V910
J908 TP G
J901
6
O-180/ARC-21
SERIAL NO.
AF 33(038)-18325

Figure 15-2. Oscillator, Radio Frequency O-180A/ARC-21, Top

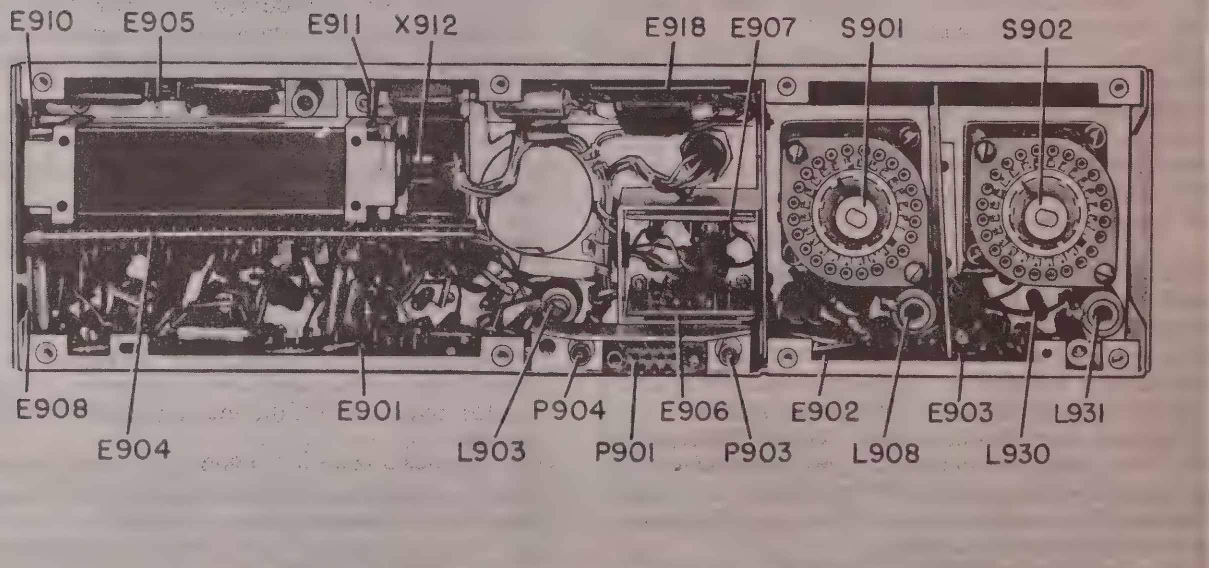
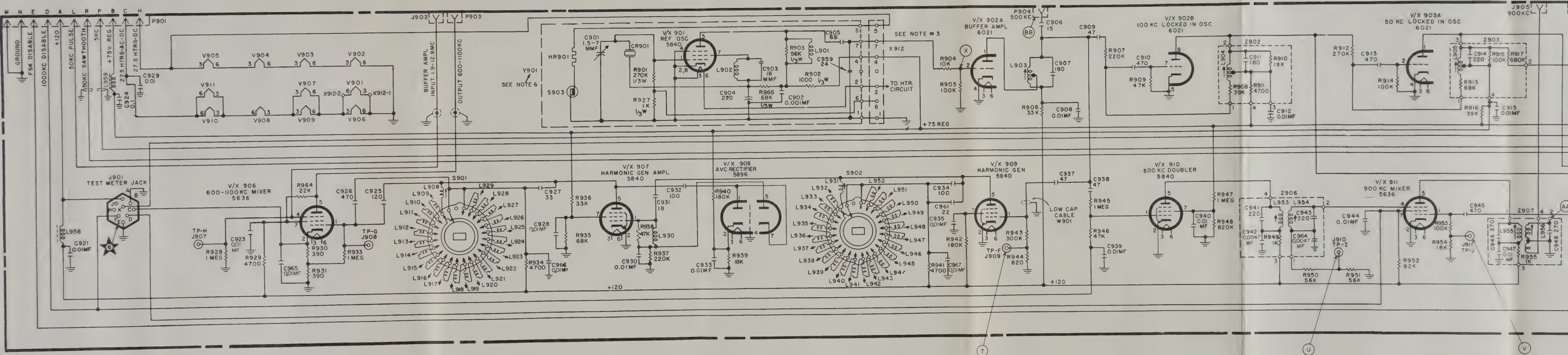
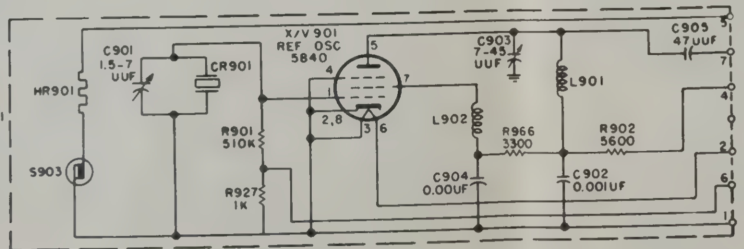
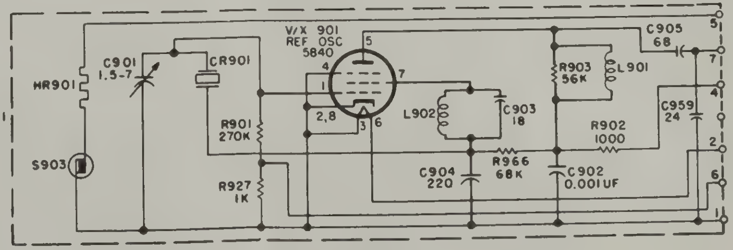
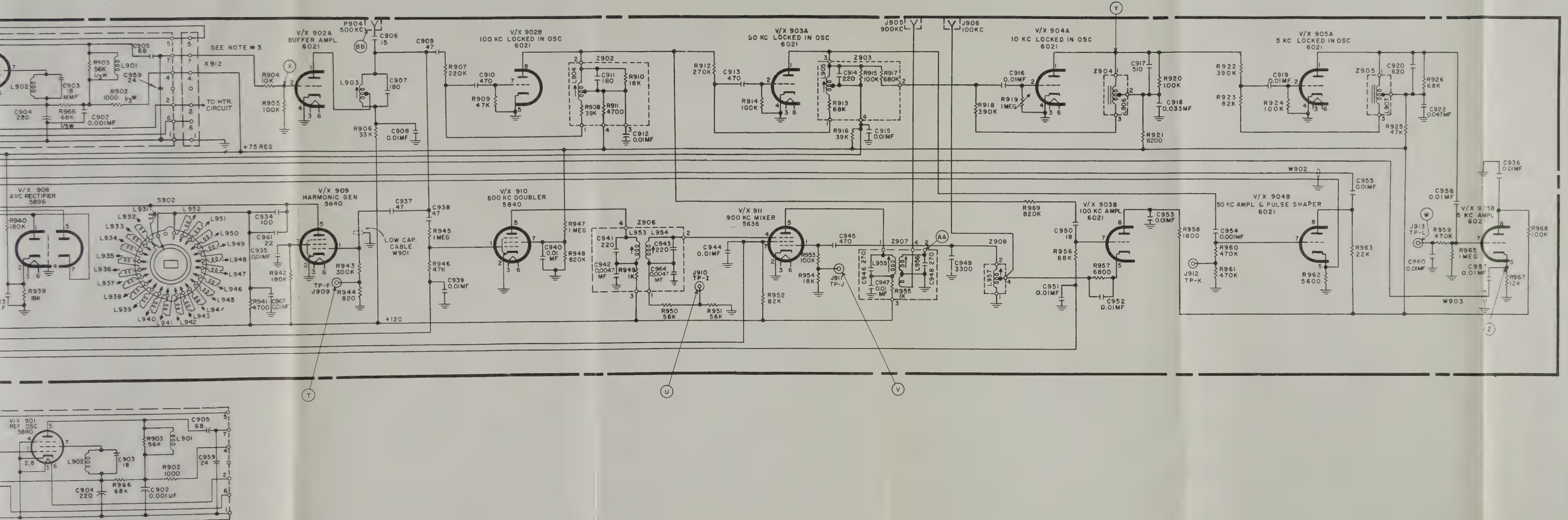

E910
E905
E911
X912
E918
E907
S901
S902
E908
E901
P904
E906
E902
E903
L931
E904
L903
P901
P903
L908
L930

Figure 15-3. Oscillator, Radio Frequency O-180A/ARC-21, Bottom


M N E D A L R P B C H
GROUND
FSK DISABLE
1000KC DISABLE
+120
50KC PULSE
50KC SAWTOOTH
5KC
+75V REG
27.5 HTRS-AC-DC
27.5 HTRS-DC
P901
C929 0.01
V905 V904 V903 V902
V911 V907 V901
V910 V908 V909 V906
X912-2 X912-1
L959
C924 0.1
J902 P903
BUFFER AMPL INPUT 1.9-12.9MC
OUTPUT 600-1100KC
Y901
SEE NOTE 6
HR901
S903
C901 1.5-7 MMF
CR901
V/X 901 REF OSC 5840
R901 270K 1/3W
R927 1K 1/3W
L902
C903 18 MMF
C904 220
R966 68K 1/3W
C902 0.001MF
R903 56K 1/3W
L901
C905 68
C959 24
R902 1000 1/3W
SEE NOTE #3
X912
TO HTR. CIRCUIT
+75 REG
P904 500KC
V/X 902A BUFFER AMPL 6021
R904 10K
R905 100K
C906 15
L903
C907 180
R906 33K
C908 0.01MF
C909 47
V/X 902B 100 KC LOCKED IN OSC 6021
R907 220K
C910 470
R909 47K
Z902
C911 180
R910 18K
L904
R908 39K
R911 4700
C912 0.01MF
J905 900KC
V/X 903A 50 KC LOCKED IN OSC 6021
R912 270K
C913 470
R914 100K
Z903
L905
C914 220
R915 100K
R917 680K
R913 68K
R916 39K
C915 0.01MF
J901 TEST METER JACK
V/X 906 600-1100KC MIXER 5636
R964 22K
C926 470
C925 120
TP-H J907
R928 1MEG
C923 0.01 MF
R929 4700
C965 0.01MF
R930 390
R931 390
TP-G J908
R933 1MEG
L958
C921 0.01MF
S901
L908 L909 L910 L911 L912 L913 L914 L915 L916 L917 L918 L919 L920 L921 L922 L923 L924 L925 L926 L927 L928 L929
C927 33
C928 0.01MF
R934 4700
C966 0.01MF
R936 33K
R935 68K
V/X 907 HARMONIC GEN AMPL. 5840
C932 100
C931 18
R938 1K
47K
L930
R937 220K
C930 0.01MF
V/X 908 AVC RECTIFIER 5896
R940 180K
R939 18K
C933 0.01MF
S902
L931 L932 L933 L934 L935 L936 L937 L938 L939 L940 L941 L942 L943 L944 L945 L946 L947 L948 L949 L950 L951 L952
C934 100
C961 22
C935 0.01MF
R942 180K
R941 4700
C967 0.01MF
V/X 909 HARMONIC GEN 5840
R943 300K
TP-F J909
R944 820
C937 47
LOW CAP. CABLE W901
C938 47
R945 1MEG
R946 47K
C939 0.01MF
+120
V/X 910 500 KC DOUBLER 5840
C940 0.01 MF
R947 1MEG
R948 820K
Z906
L953 L954
C941 220
C943 220
C942 0.0047 MF
R949 1K
C964 0.0047 MF
C944 0.01MF
J910 TP-I
R950 56K
R951 56K
V/X 911 900 KC MIXER 5636
C945 470
R953 100K
R954 18K
J911 TP-J
R952 82K
Z907
L955 L956
C946 270
C947 0.01 MF
C948 270
R955 1K
AA
BB
X
T
U
V


Y901
HR901
S903
C901 1.5-7 UUF
CR901
X/V 901 REF OSC 5840
C903 7-45 UUF
C905 47UUF
L901
R901 510K
R927 1K
2,8
L902
R966 3300
R902 5600
C904 0.00UF
C902 0.001UF


Y901
HR901
S903
C901 1.5-7
CR901
V/X 901 REF OSC 5840
R901 270K
R927 1K
2,8
L902
C903 18
R903 56K
L901
C905 68
C959 24
R902 1000
C904 220
R966 68K
C902 0.001UF


V/X 902A BUFFER AMPL 6021
V/X 902B 100 KC LOCKED IN OSC 6021
V/X 903A 50 KC LOCKED IN OSC 6021
V/X 904A 10 KC LOCKED IN OSC 6021
V/X 905A 5 KC LOCKED IN OSC 6021
V/X 908 AVC RECTIFIER 5896
S902
V/X 909 HARMONIC GEN 5840
V/X 910 500 KC DOUBLER 5840
V/X 911 900 KC MIXER 5636
V/X 903B 100 KC AMPL 6021
V/X 904B 50 KC AMPL & PULSE SHAPER 6021
V/X 905B 5 KC AMPL 6021
V/X 901 REF OSC 5840
P904 500KC
J905 900KC
J906 100KC
SEE NOTE # 3
X912
TO HTR. CIRCUIT
+75 REG
+120
LOW CAP. CABLE W901
W902
W903
TP-F J909
J910 TP-I
J911 TP-J
J912 TP-K
J913 TP-L
Z902
Z903
Z904
Z905
Z906
Z907
Z908
T
U
V
W
X
Y
Z
AA
BB

NOTE 1
ALL CAPACITOR VALUES IN MMF UNLESS OTHERWISE SHOWN

NOTE 2.
ALL RESISTORS 1/2 W UNLESS OTHERWISE SHOWN

NOTE 3
HEADER PLUG PART OF Y901 HAS SAME PIN NO ARRANGEMENT AS 7 PIN SOCKET

Figure 15-4. Oscillator, Radio Frequency O-180A/ARC-21, Schematic Diagram

(viewed from bottom of chassis) by one switch position. The switches are now in the 22-mc position. Adjust inductors L909 and L932 for maximum reading on the voltmeter. The frequency meter must indicate approximately 13.0 mc.

h. Repeat the above procedure for each megacycle position in sequence and in accordance with table LXXXVII. Advance switches S901 and S902 counterclockwise by one switch position each time a pair of coils has been aligned.

i. Check the voltage at TP-G (jack J908) with switches in each megacycle position 2 through 23. The voltage should be between 0.44 and 0.66 volt ac. Retune the megacycle positions not within this voltage range. Minimum voltages should be at the approximate megacycle positions 5 and 14, and maximum voltages on megacycle positions 2, 9, and 20.

j. Install bottom cover.

k. Set switches S901 and S902 to megacycle position 23.

l. Install chassis in Chassis, Receiver-Transmitter MX-1424A/ARC-21 and repeak inductor L903 as given in paragraph 6-182b.

15-22. MINIMUM PERFORMANCE STANDARDS.

15-23. On completion of repairs and alignment, check the chassis for meeting the minimum performance standards given in table LXXXVIII before returning the chassis for use.

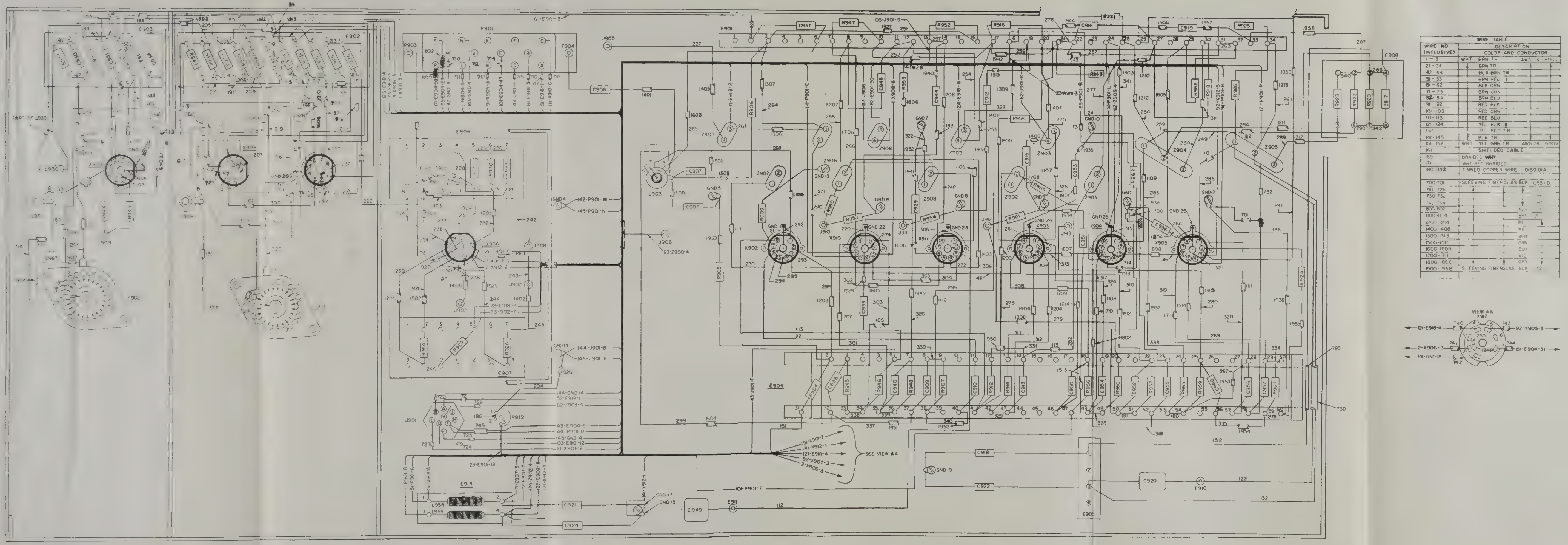
TABLE LXXXVIII. MAINTENANCE CHECK LIST FOR OSCILLATOR, RADIO FREQUENCY, O-180A/ARC-21

I. VISUAL INSPECTION

UNIT	CHECK FOR
Chassis, Components	Dents, cracks, bent pins, stripped threads, dirt, dust, corrosion, discoloration, burned or deteriorated insulation.

II. ALIGNMENT

		IN			OUT			
Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
1. Preliminary	15-13	Bench Test Setup			TS-375/U	V902A-2	-16 to -24V dc	Indicates V901 is oscillating
2. L903 Adjustment	15-13	Bench Test Setup			ME-75/ARC-21	TP-F	Max Voltage	Align divider circuit
3. Z902 Adjustment	15-14	TS-413/U	OS-8/U (Horiz)	100 kc	OS-8/U (Vert)	V902-8	1-1 Lissajous pattern	Ground V902-2 and adjust V902
4. Z903 Adjustment	15-15	TS-413/U	OS-8/U (Horiz)	100 kc	OS-8/U (Vert)	V902-8	2-1 Lissajous pattern	Remove ground at V902-2 and adjust V903
4. Lock-in Check	15-16	TS-413/U	X912-7	500 kc	ME-75/ARC-21 OS-8/U (Vert)	TP-F V904-5	Same as Step 2 Lissajous pattern	


P901
P903
P904
J905
J906
J907
J908
J901
J902
E901
E902
E903
E904
E905
E906
E907
E908
E910
E911
E918
L930
L903
L958
L959
X902
X903
X904
X905
X910
X911
X912
Z902
Z903
Z904
Z905
Z906
Z907
Z908
C906
C907
C908
C916
C918
C919
C920
C921
C922
C924
C937
C949
R921
R925
R947
R952
R916
SEE VIEW AA
VIEW AA
X912
PART OF L930

WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1 - 3	WHT BRN TR AWG 24 600V
21 - 24	GRN TR
42 44	BLK BRN TR
51 - 53	BRN RED
61 - 62	BLK GRN
71 - 73	BRN GRN
82 - 84	BRN BLU
91 92	RED BLK
101 - 103	RED GRN
111 - 113	RED BLU
121 - 124	YEL BLK
132	YEL RED TR
141 - 145	BLK TR
151 - 152	WHT YEL GRN TR AWG 24 600V
161	SHIELDED CABLE
165	BRAIDED WHT
171	WHT RED BRAIDED
180 342	TINNED COPPER WIRE 0159 DIA
700-701	SLEEVING FIBERGLAS BLK 053 I.D.
710 - 726	[illegible]
730-732	[illegible]
740 744	[illegible]
800 802	[illegible]
1100-1114	BRN [illegible]
1200 1214	RED
1400 1408	YEL
1300 1313	WHT
1500-1515	GRN
1600-1608	BLU
1700-1711	VIO
1800-1806	GRY
1900-1958	SLEEVING FIBERGLAS BLK [illegible]

Figure 15-5. Oscillator, Radio Frequency O-180A/ARC-21, Connection Diagram

TABLE LXXXVIII. MAINTENANCE CHECK LIST FOR OSCILLATOR, RADIO FREQUENCY O-180A/ARC-21 (continued)

Test Step	Reference Paragraph	Test Equipment	Test Point	Signal In	Test Equipment	Test Point	Signal Out	Remarks
							No drop-out between 490 and 510 kc	Remove ground from X912-7. Adjust TS-413/U Output Disconnect existing lead X912-7 Adjust TS-413/U Vary frequency above and below 500 kc Note when pattern drops out of synchronism
5. Z906, Z907, Z908 Adjustment	15-17	Bench Test Setup			ME-75/ARC-21	J1U TP-I	Max Voltage	Ground P901- Adjust L953, L954
						J11 TP-J	Max Voltage	Adjust L957
					TS-375/U	Z907-2	Max Voltage	Adjust L955, L956
6. Associated Circuits	15-18	Bench Test Setup			OS-8/U	V509-1 (Vert) J904-BB (Horiz)	9-5 Lissajous pattern (Single Peak)	Adjust T507 in Amplifier-Oscillator AM-776A/ARC-21
					TS-375/U	V509-1	Max Voltage	Repeak T507, Z906, Z907, Z908
7. Thousands Harmonic Generator Alignment	15-20	Bench Test Setup			ME-75/ARC-21	J909 TP-F	Max Voltage	Adjust L903
					TS-375/U	J908 TP-G	Max Voltage	Adjust L910 through L929, L933 through L952
					FR-47/U	P903	See Table LXXXVII	

III. MINIMUM PERFORMANCE STANDARDS

Test Point	Voltage	Remarks
TP-G (J908)	0.44 to 0.66 volt rms	All megacycle positions from 23 to 2
P901 pin P	15.7 to 26 volts	Peak to peak. 5-kc pulse
P901 pin L	15.7 to 26 volts	Peak to peak. 50-kc pulse
P901 pin R	13.4 to 18.0 volts	Peak to peak. 50-kc sawtooth
T507	0.9 to 1.75 volts rms	900-kc voltage
J906 pin 5	0.8 volt minimum	600 to 1100 kc with T801 connected

SECTION XVI

MAINTENANCE INSTRUCTIONS FOR RELAY ASSEMBLY RE-135B/ARC-21

16-1. TROUBLE ANALYSIS.

16-2. GENERAL. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

16-3. INSPECTION. A defective chassis should first be examined for visible signs of damage or defect. Check for dirt, dust, corrosion, dents, cracks, discoloration, bent pins, deteriorated insulation. Pay particular attention to the glass bases of the sealed relays.

16-4. TROUBLE ANALYSIS. With a Multimeter TS-352/U, check d-c resistance of all relay coils by reference to schematic diagram, figure 16-3, and replace relays found defective. Similarly check resistors in the chassis for deviation from design values. Resistance from V1001 pins 1 and 9 to ground should be 27 ohms. See table LXXXIX for resistance measurements from plug P1001 to ground.

16-5. Connect the chassis into the test setup and perform the procedure given in table XC. Either mount the chassis in the Chassis, Receiver-Transmitter MX-1424A/ARC-21 or connect it to the test setup by test cables.

16-6. CIRCUIT ANALYSIS.

16-7. This chassis contains the relays that function in conjunction with the ERA Coupler to permit proper matching of the transmitter output to the fixed wire antenna.

16-8. Relay K1001 sets up either CW or voice operation. Relay K1003 provides the necessary operations to start a new tuning cycle when the channel selector is tuned to a new channel. Energized by the frequency change pulse, it locks through contacts 2 and 12 and relay K1004 contacts 7 and 8.

16-9. During coupler tune, relay K1005 operates to lock the key-down and charge C1001. When relay K1005 is de-energized, relay K1004 operates momen-

TABLE LXXXIX. RESISTANCE IN OHMS, FROM PINS OF PLUG P1001 TO GROUND

Conditions: Removed from setup. No cables connected.

Pin	A	B	C	D	E	F	H	J	K	L
Reading	**	**	**	**	**	** *	**	0	**	**
Pin	M	N	P	R	S	T	U	V	W	X
Reading	390	**	**	0	390	**	**	**	**	**
Pin	Y	Z	AA	BB	CC	DD	EE	FF	HH	JJ
Reading	**	**	**	**	**	**	**	**	0	390
Pin	KK	LL	MM	NN						
Reading	**	**	**	0						

* Observe proper polarity.
** Infinite resistance value.

TABLE XC. TROUBLE ANALYSIS, RELAY ASSEMBLY RE-135B/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 16-3

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	9 (J1001)	Test Meter plugged in. Selector switch at position 4	Radio Set Control C-451A/ARC-21. Set for "VOICE" operation, "POWER" at "LOW," "CONTROL" at "ON"	+120 volts	Broken supply lead
2	9 (J1001)	Selector switch at position 6	Same as step 1	+20 volts (Heater supply)	Open heater on V1001 or broken supply lead

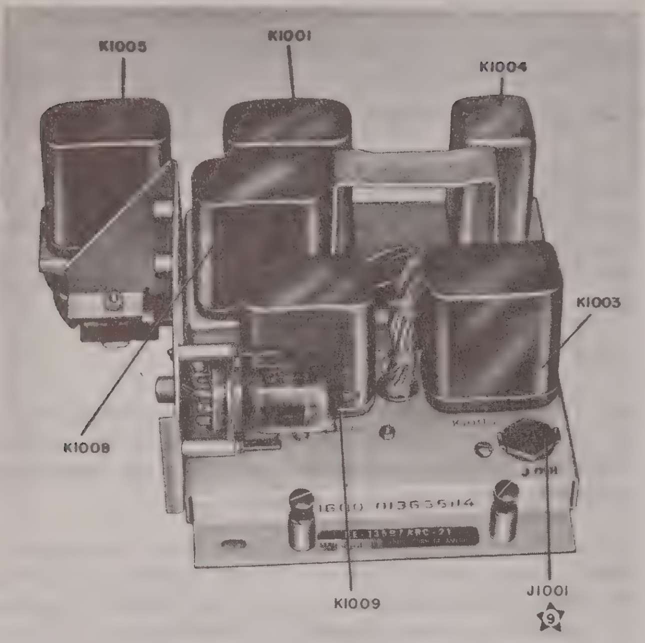


Figure 16-1. Relay Assembly RE-135B/ARC-21, Top

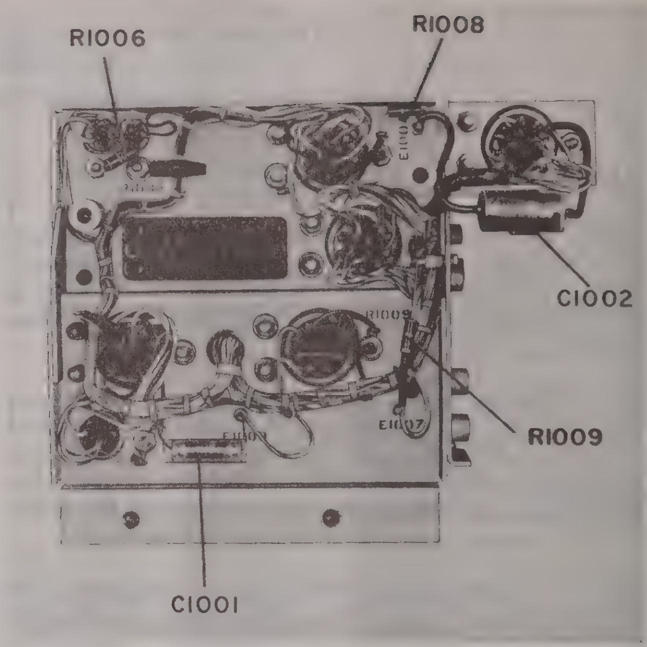
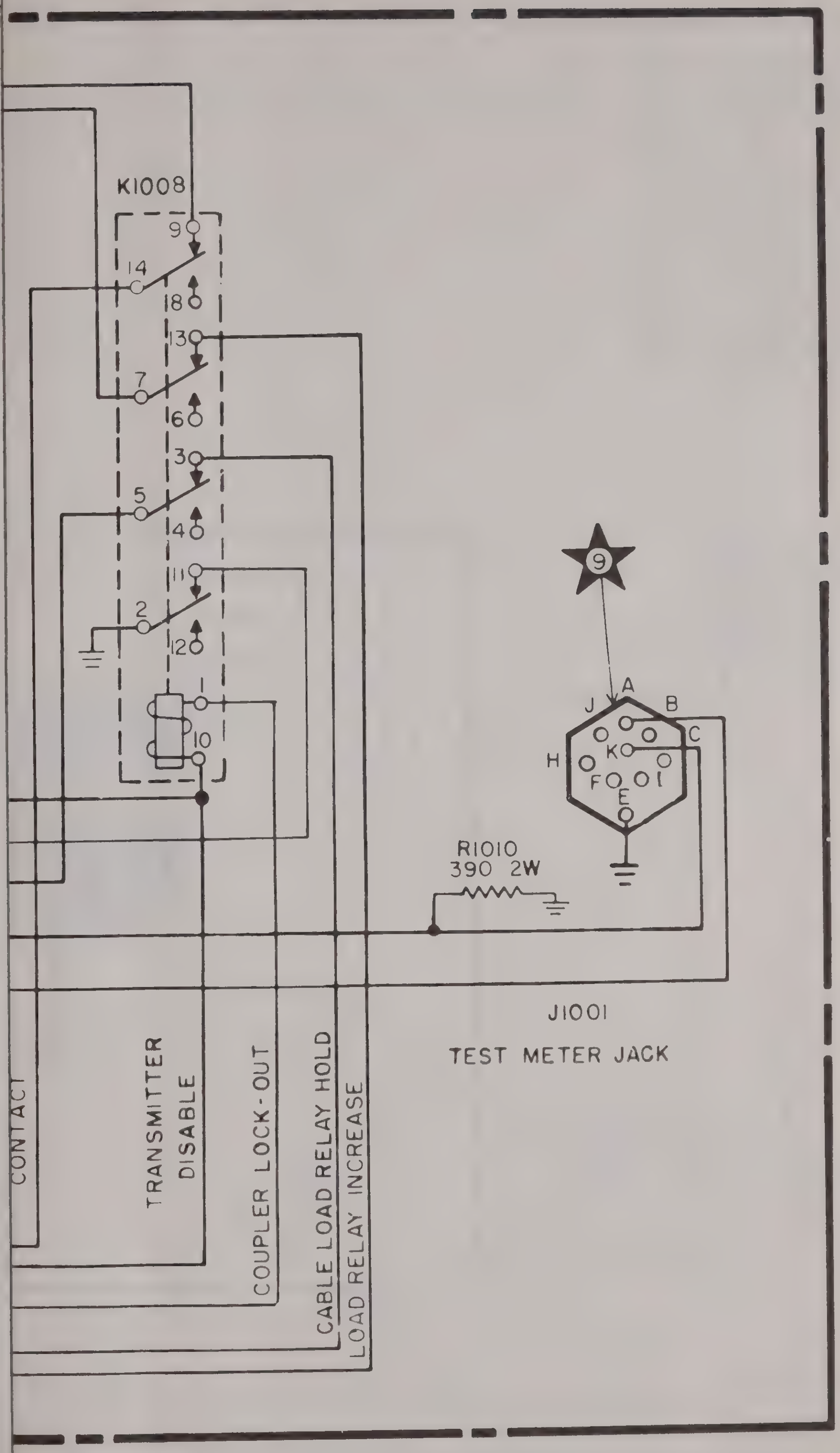


Figure 16-2. Relay Assembly RE-135B/ARC-21, Bottom

tarily. This is due to capacitor C1001 being charged to 120 volts when relay K1005 is energized. Capacitor C1001 then discharges through relay K1004 and resistor R1006 when relay K1005 opens. When energized, relay K1004 starts the transmitter retune cycle and opens the coil circuit of relay K1003 if closed. When released, relay K1004 closes the retune pulse circuit and closes the holding circuit of relay K1003. This latter circuit can only be completed once relay K1003 is energized momentarily from another source. Relay K1005 completes the keying relay coil circuit and the previously explained coil circuit of relay K1004. The coil is energized through the homing lockout circuits in the ERA Coupler.

16-10. The energizing voltage for relay K1008 comes from the transmitter disable and coupler lockout circuits from the power amplifier relay chassis. Contacts 2 and 12 of relay K1008 change the load relay (K107) level by shorting out a portion of the associated voltage divider. Arm 5 closes the cable loading relay holding circuit when in the de-energized positions. Arm 14, when relay K1008 is energized, connects all load information to K1005 through contacts 7 and 6 on K1007, and also disables the load relay (decreased) from the transmitter. Arm 7 disables the load relay (increase) from the transmitter when K1008 is energized.

16-11. Relay K1009 is energized by the retune lockout voltage from relay K103. The circuit is completed through contacts 7 and 13 of relay K1003 when the latter is de-energized. Relay K1009 locks through contacts 3 and 4, and grounds the coil of relay K1008 through contacts 5 and 6.


K1008
9
14
18
13
7
6
3
5
4
11
2
12
1
10
9
A
J
B
C
K
H
F
I
E
R1010
390 2W
J1001
TEST METER JACK
CONTACT
TRANSMITTER DISABLE
COUPLER LOCK-OUT
CABLE LOAD RELAY HOLD
LOAD RELAY INCREASE

elay Assembly RE-135B/ARC-21, Schematic Diagram

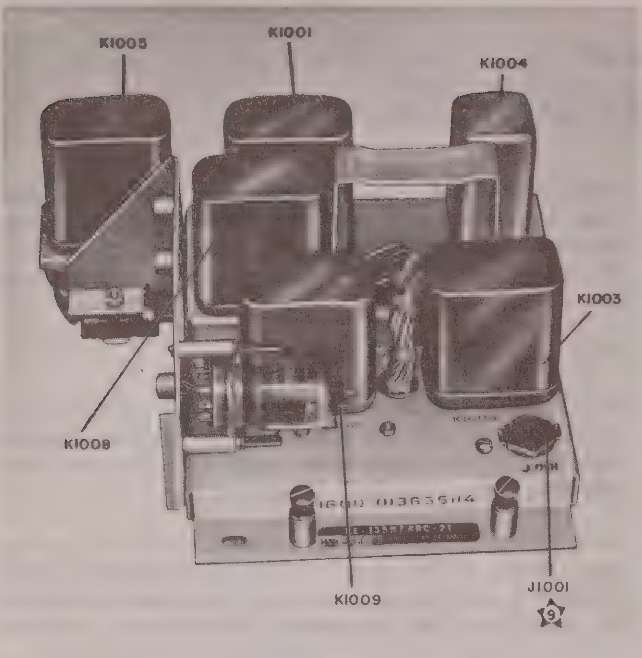


Figure 16-1. Relay Assembly RE-135B/ARC-21, Top

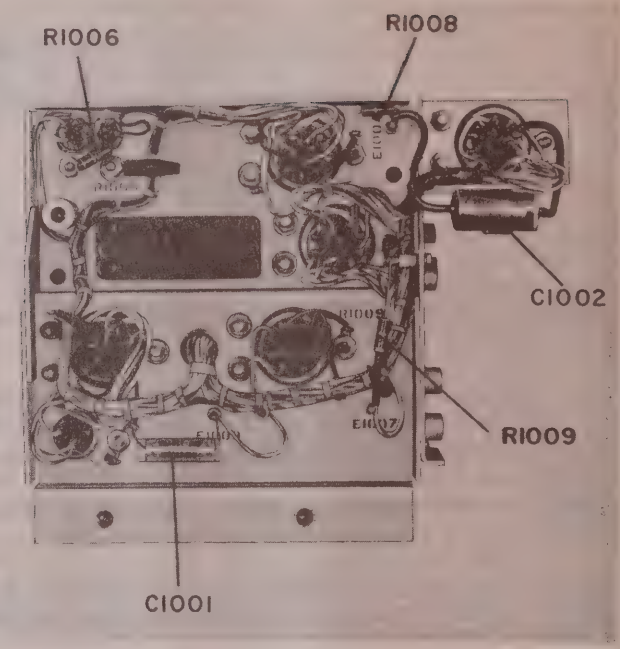
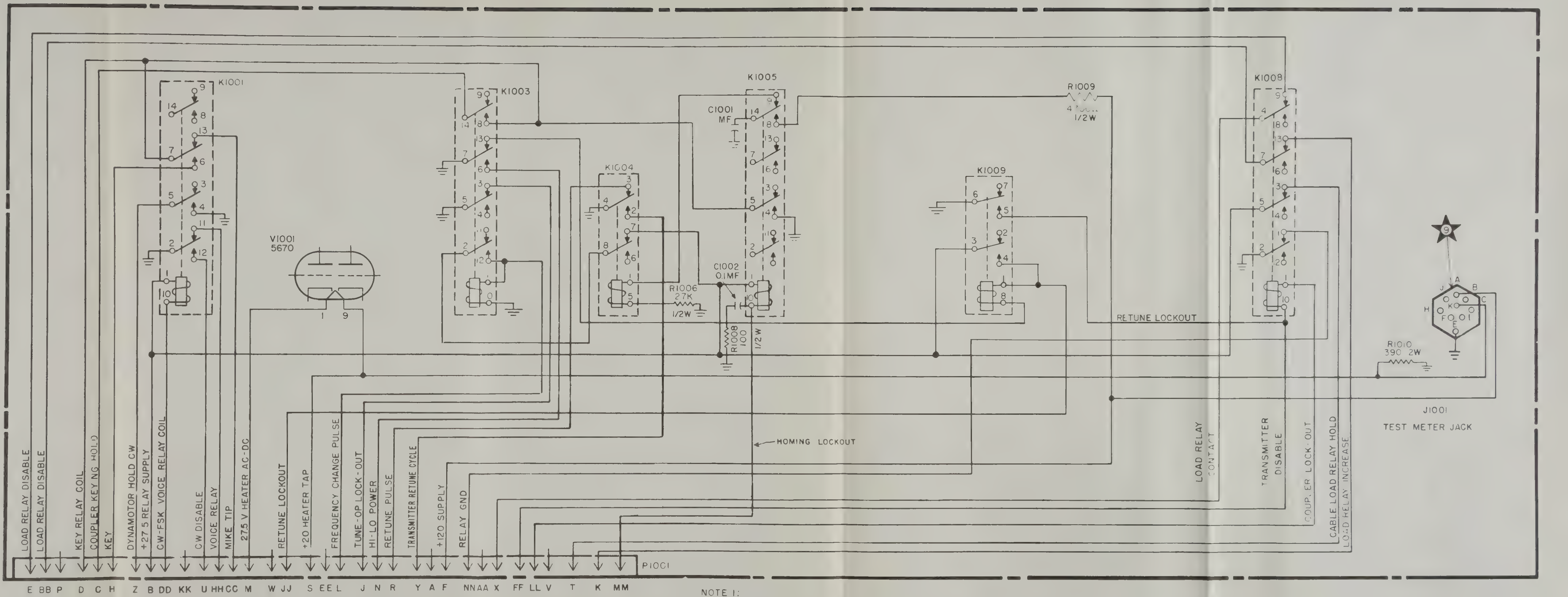


Figure 16-2. Relay Assembly RE-135B/ARC-21, Bottom

tarily. This is due to capacitor C1001 being charged to 120 volts when relay K1005 is energized. Capacitor C1001 then discharges through relay K1004 and resistor R1006 when relay K1005 opens. When energized, relay K1004 starts the transmitter retune cycle and opens the coil circuit of relay K1003 if closed. When released, relay K1004 closes the retune pulse circuit and closes the holding circuit of relay K1003. This latter circuit can only be completed once relay K1003 is energized momentarily from another source. Relay K1005 completes the keying relay coil circuit and the previously explained coil circuit of relay K1004. The coil is energized through the homing lockout circuits in the ERA Coupler.

16-10. The energizing voltage for relay K1008 comes from the transmitter disable and coupler lockout circuits from the power amplifier relay chassis. Contacts 2 and 12 of relay K1008 change the load relay (K107) level by shorting out a portion of the associated voltage divider. Arm 5 closes the cable loading relay holding circuit when in the de-energized positions. Arm 14, when relay K1008 is energized, connects all load information to K1005 through contacts 7 and 6 on K1007, and also disables the load relay (decreased) from the transmitter. Arm 7 disables the load relay (increase) from the transmitter when K1008 is energized.

16-11. Relay K1009 is energized by the retune lockout voltage from relay K103. The circuit is completed through contacts 7 and 13 of relay K1003 when the latter is de-energized. Relay K1009 locks through contacts 3 and 4, and grounds the coil of relay K1008 through contacts 5 and 6.


K1001
K1003
K1004
K1005
K1008
K1009
V1001
5670
C1001
MF
C1002
0.1MF
R1006
27K
1/2W
R1008
100
1/2W
R1009
4
1/2W
R1010
390 2W
RETUNE LOCKOUT
HOMING LOCKOUT
J1001
TEST METER JACK
P1001
LOAD RELAY DISABLE
LOAD RELAY DISABLE
KEY RELAY COIL
COUPLER KEYING HOLD
KEY
DYNAMOTOR HOLD CW
+27.5 RELAY SUPPLY
CW-FSK VOICE RELAY COIL
CW DISABLE
VOICE RELAY
MIKE TIP
27.5 V HEATER AC-DC
RETUNE LOCKOUT
+20 HEATER TAP
FREQUENCY CHANGE PULSE
TUNE-OP LOCK-OUT
HI-LO POWER
RETUNE PULSE
TRANSMITTER RETUNE CYCLE
+120 SUPPLY
RELAY GND
LOAD RELAY CONTACT
TRANSMITTER DISABLE
COUPLER LOCK-OUT
CABLE LOAD RELAY HOLD
LOAD RELAY INCREASE
E BB P D C H Z B DD KK U HH CC M W JJ S EE L J N R Y A F NN AA X FF LL V T K MM
9

NOTE 1:

RESISTANCE VALUES IN OHMS UNLESS OTHERWISE STATED

Figure 16-3. Relay Assembly RE-135B/ARC-21, Schematic Diagram

SECTION XVII

MAINTENANCE INSTRUCTIONS FOR CHASSIS, RECEIVER-TRANSMITTER MX-1424A/ARC-21

17-1. TROUBLE ANALYSIS.

17-2. The receiver-transmitter chassis can best be checked by circuit checking the various leads using Multimeter TS-352/U operated as an ohmmeter. Use schematic diagram figure 17-4 as a guide. The rectifier, CR1201, can be checked by measuring the front to back conduction ratio of the separate sections by reversing the ohmmeter leads. The thermostat can be checked by applying heat to the thermostat while the ohmmeter is connected across its terminals. The ohmmeter will indicate zero ohms when the thermostat closes. The aneroid switch must be checked under low-pressure conditions since it will close at the equivalent of 15,000-foot altitude. The filter chassis can be removed as a unit.

17-3. CIRCUIT ANALYSIS.

17-4. HEATERS. To offset the effects of low temperatures on the mechanical assemblies, two heaters HR1201 and HR1202 are attached to the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Thermostat S1203 controls the operation of the heaters through relays K1203 and K1204. At temperatures below -34°C (-29°F) the thermostat opens de-energizing relay K1203 which energizes relay K1204 in turn energizing the heaters and at the same time disabling the timing cycle through relay K1203. A preheat cycle of approximately 30 minutes is required if the equipment temperature is -55°C (-67°F).

17-5. INPUT FILTER. The input filter mounts in the dome front of the Receiver-Transmitter RT-128A/ARC-21. All leads to the various units inside the case are filtered by appropriate filters to prevent the passage of electrical noise. In addition to the filters, two relays K1101 and K1102 are mounted in the filter assembly. These relays are not filtered since their circuits are external to Receiver-Transmitter RT-128A/ARC-21. Relay K1101 is the master trip relay and relay K1102 is the "take control" relay.

17-6. Four types of filters are used, which may be identified as follows:

Z1101: 20-ampere rating unit for filtering the 27.5-volt supply.

Z1102: 14-circuit medium-current filter.

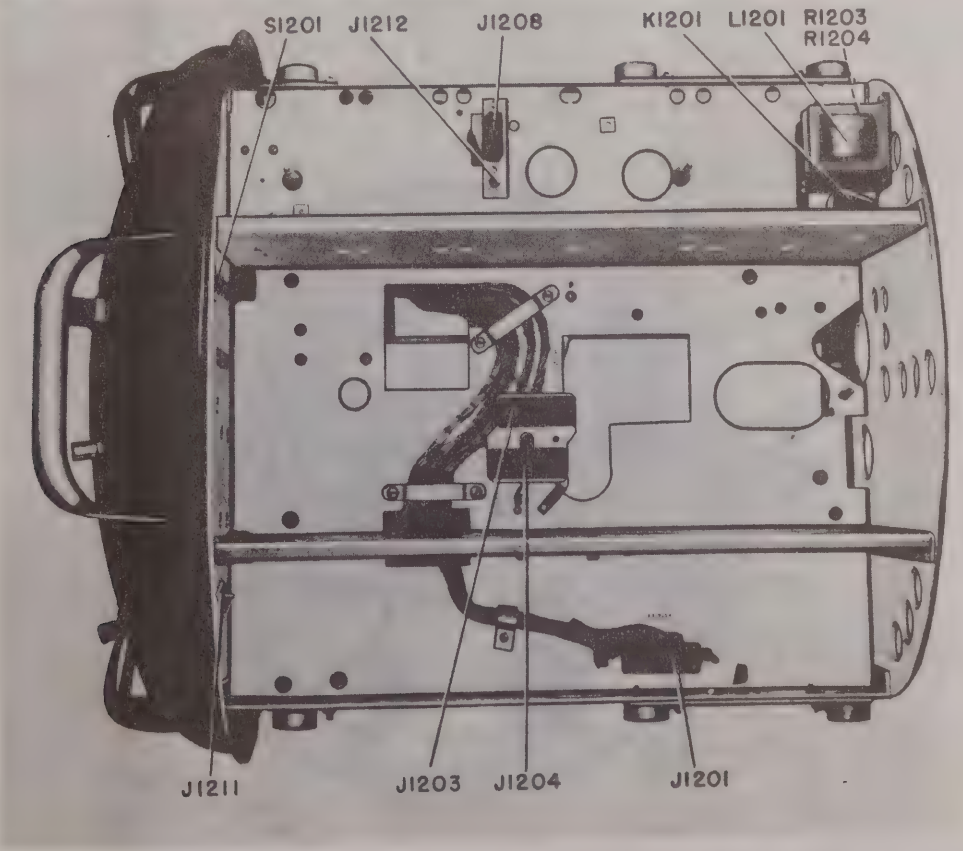


Figure 17-1. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Top, Units Removed

WIRE TABLE		
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR	
1	WHT - BLK TR AWG 24	600V
10-14	- BRN	
21-23	- RED	
31-32	- ORN	
41	- YEL	
61-62	- BLU TR	
71	- BLK / BRN TRS	
81	- BLK / RED	
101-103	- BRN / RED	
111	- BRN / GRN	
131	- RED / BLK	
151	- RED / BLU	
171-173	- YEL / RED	
181	- YEL / GRN	
191	- GRN / BLK	
201	- GRN / BRN	
211	- GRN / RED	
221	- BLU / BRN	
231-232	WHT - BLU / RED TRS AWG24	600V
240	SLEEVING SILICON RUBBER	095 I D

WIRE TABLE			8838376 - 502
WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR		WIRE NUMBERS NOT USED
251-252	GRN AWG 24	600V	
261-262	BLK		
271	YEL		
281	GRAY		
291-294	ORN		292, 293
301	BLU		
315	WHT AWG 24	600V	
404-428	TINNED COPPER WIRE 020 DIA		405 TO 412,418,423,424,426,427
557-562	SLEEVING SILICON RUBBER	022 I D	560, 561
571-574	SLEEVING SILICON RUBBER	042 I D	573

FIG 1

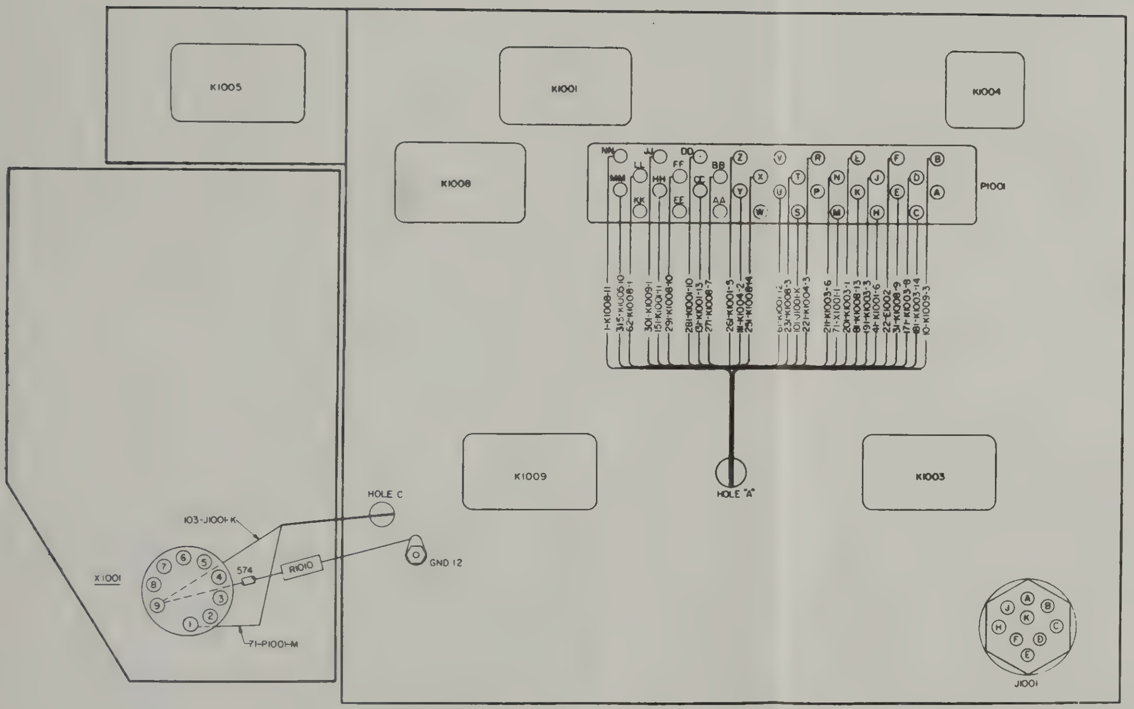

K1005
K1001
K1004
K1008
P1001
K1009
HOLE "A"
K1003
HOLE C
103-J1001-K
X1001
574
R1010
GND 12
71-P1001-M
J1001

FIG 2

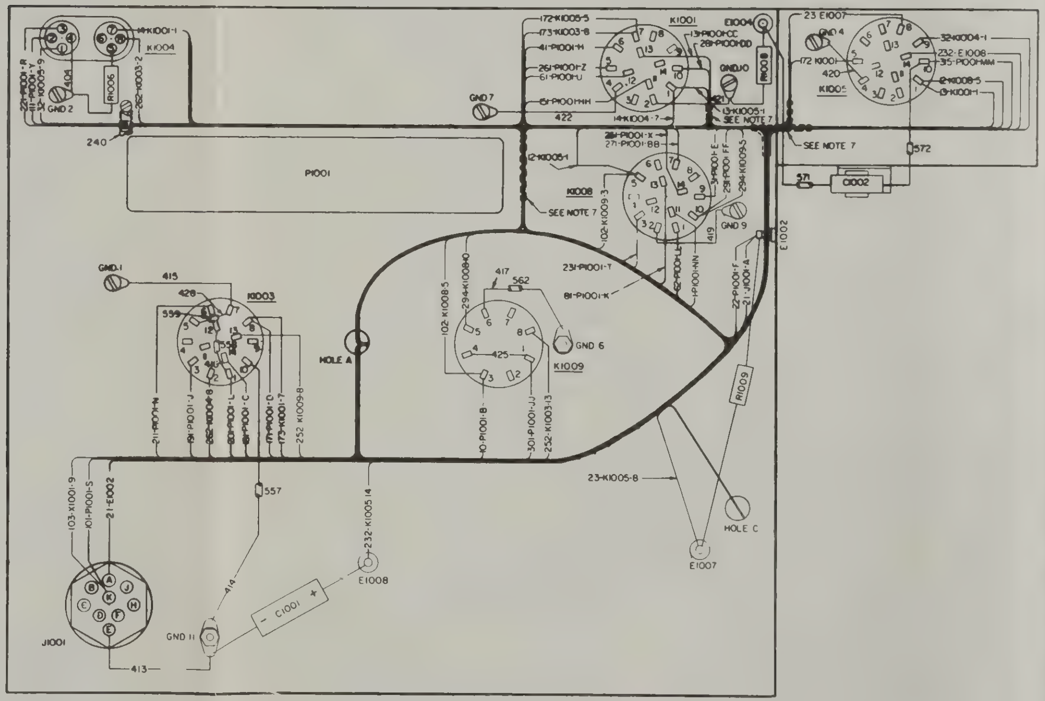

K1004
GND 2
R1006
240
P1001
GND 7
422
K1001
E1004
R1008
K1008
SEE NOTE 7
GND 9
E1002
23 E1007
GND 4
420
K1005
572
571
C1002
GND.1
415
428
K1003
559
HOLE A
417
562
425
K1009
GND 6
R1009
557
23-K1005-8
HOLE C
E1007
J1001
GND 11
C1001
E1008
413
414

Figure 16-4. Relay Assembly RE-135B/ARC-21, Connection Diagram

SECTION XVII

MAINTENANCE INSTRUCTIONS FOR CHASSIS, RECEIVER-TRANSMITTER MX-1424A/ARC-21

17-1. TROUBLE ANALYSIS.

17-2. The receiver-transmitter chassis can best be checked by circuit checking the various leads using Multimeter TS-352/U operated as an ohmmeter. Use schematic diagram figure 17-4 as a guide. The rectifier, CR1201, can be checked by measuring the front to back conduction ratio of the separate sections by reversing the ohmmeter leads. The thermostat can be checked by applying heat to the thermostat while the ohmmeter is connected across its terminals. The ohmmeter will indicate zero ohms when the thermostat closes. The aneroid switch must be checked under low-pressure conditions since it will close at the equivalent of 15,000-foot altitude. The filter chassis can be removed as a unit.

17-3. CIRCUIT ANALYSIS.

17-4. HEATERS. To offset the effects of low temperatures on the mechanical assemblies, two heaters HR1201 and HR1202 are attached to the Chassis, Receiver-Transmitter MX-1424A/ARC-21. Thermostat S1203 controls the operation of the heaters through relays K1203 and K1204. At temperatures below -34°C (-29°F) the thermostat opens de-energizing relay K1203 which energizes relay K1204 in turn energizing the heaters and at the same time disabling the timing cycle through relay K1203. A preheat cycle of approximately 30 minutes is required if the equipment temperature is -55°C (-67°F).

17-5. INPUT FILTER. The input filter mounts in the dome front of the Receiver-Transmitter RT-128A/ARC-21. All leads to the various units inside the case are filtered by appropriate filters to prevent the passage of electrical noise. In addition to the filters, two relays K1101 and K1102 are mounted in the filter assembly. These relays are not filtered since their circuits are external to Receiver-Transmitter RT-128A/ARC-21. Relay K1101 is the master trip relay and relay K1102 is the "take control" relay.

17-6. Four types of filters are used, which may be identified as follows:

Z1101:	20-ampere rating unit for filtering the 27.5-volt supply.
Z1102:	14-circuit medium-current filter.

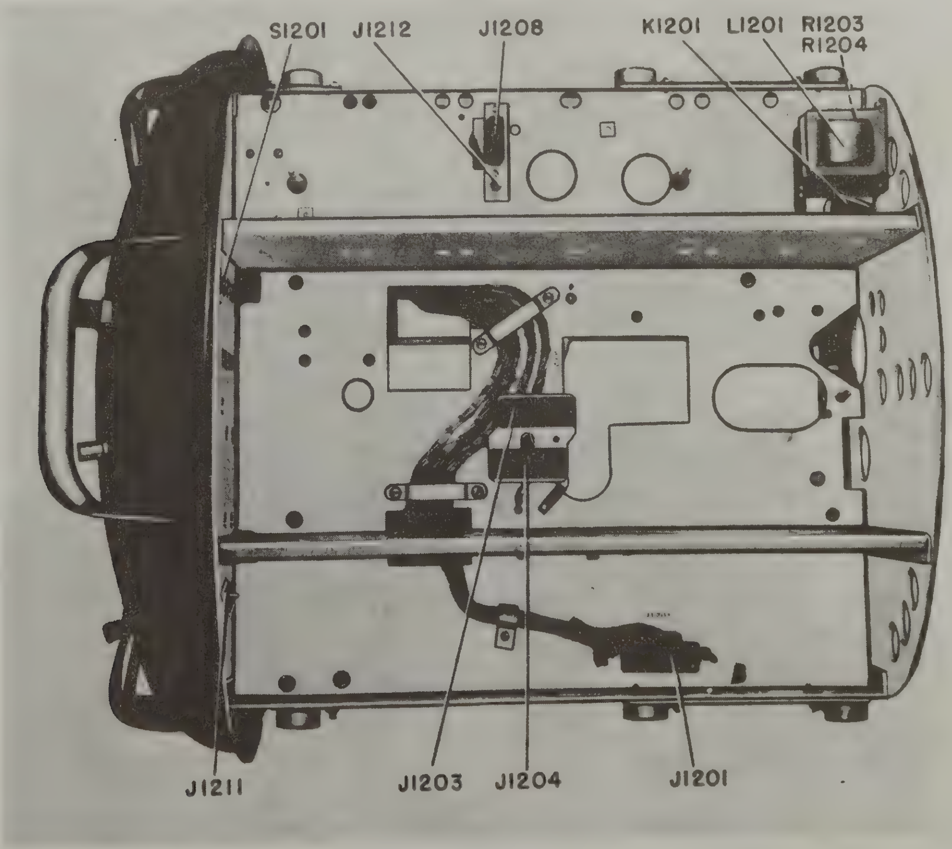


Figure 17-1. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Top, Units Removed

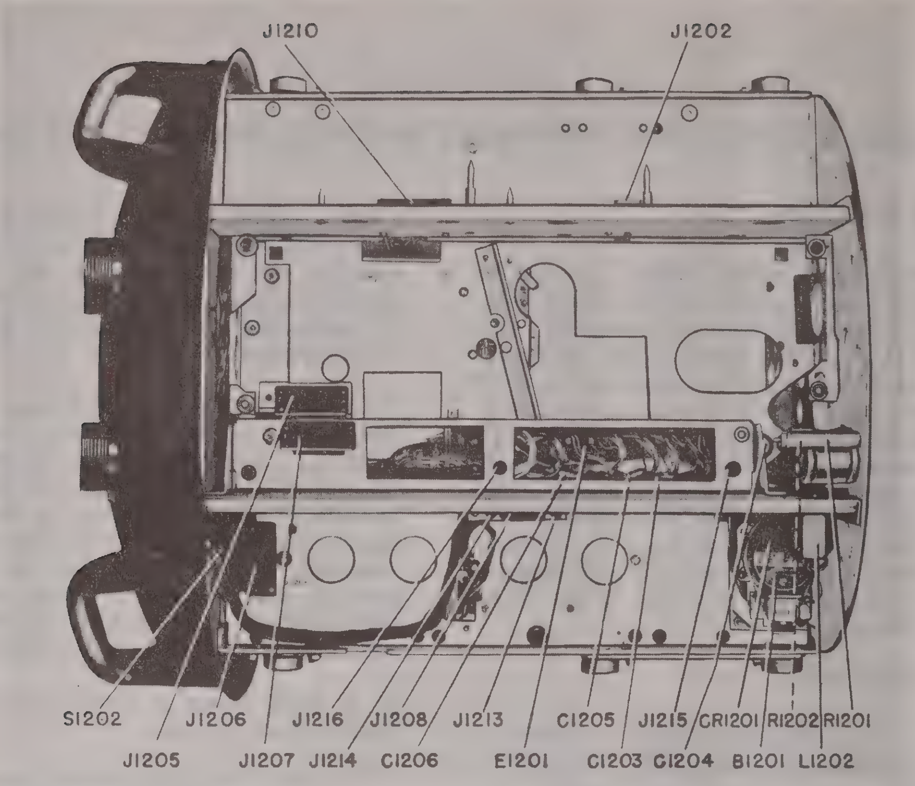

J1210
J1202
S1202
J1206
J1216
J1208
J1213
C1205
J1215
CR1201
R1202
R1201
J1205
J1207
J1214
C1206
E1201
C1203
C1204
B1201
L1202

Figure 17-2. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Bottom, Units Removed

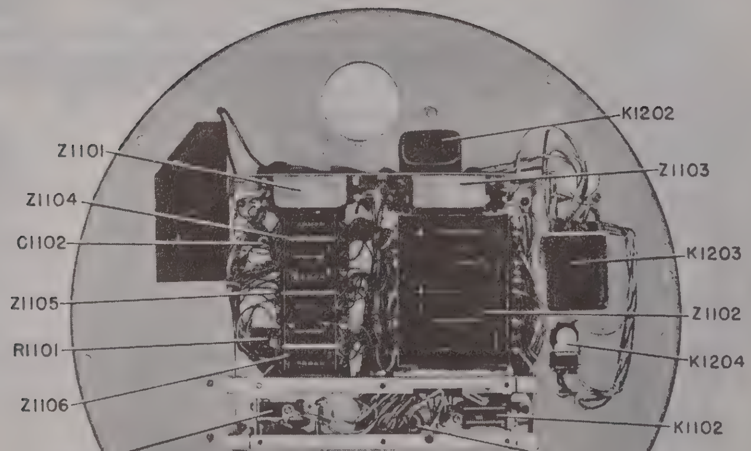
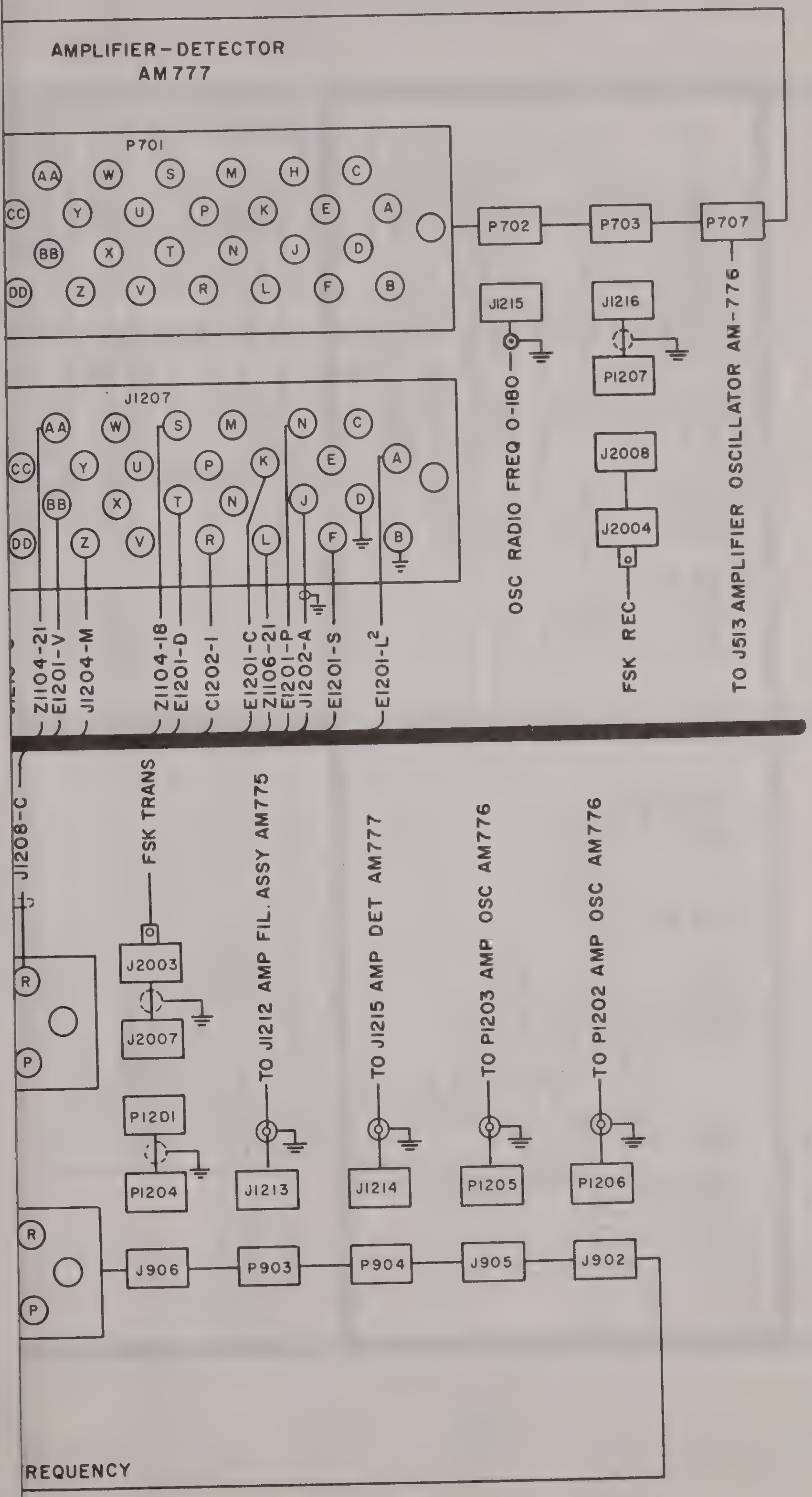

K1202
Z1101
Z1103
Z1104
C1102
K1203
Z1105
Z1102
R1101
K1204
Z1106
K1102
K1101
C1101
J1102
J1101

Figure 17-3. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Front End, Dome Removed


AMPLIFIER-DETECTOR
AM777
P701
AA
W
S
M
H
C
CC
Y
U
P
K
E
A
BB
X
T
N
J
D
DD
Z
V
R
L
F
B
P702
P703
P707
J1215
J1216
P1207
J2008
J2004
OSC RADIO FREQ O-180
FSK REC
TO J513 AMPLIFIER OSCILLATOR AM-776
J1207
Z1104-21
E1201-V
J1204-M
Z1104-18
E1201-D
C1202-1
E1201-C
Z1106-21
E1201-P
J1202-A
E1201-S
E1201-L2
J1208-C
FSK TRANS
J2003
J2007
P1201
P1204
TO J1212 AMP FIL. ASSY AM775
TO J1215 AMP DET AM777
TO P1203 AMP OSC AM776
TO P1202 AMP OSC AM776
J1213
J1214
P1205
P1206
J906
P903
P904
J905
J902
REQUENCY

r-Transmitter MX-1424A/ARC-21, Schematic Diagram (Sheet 1 of 2)

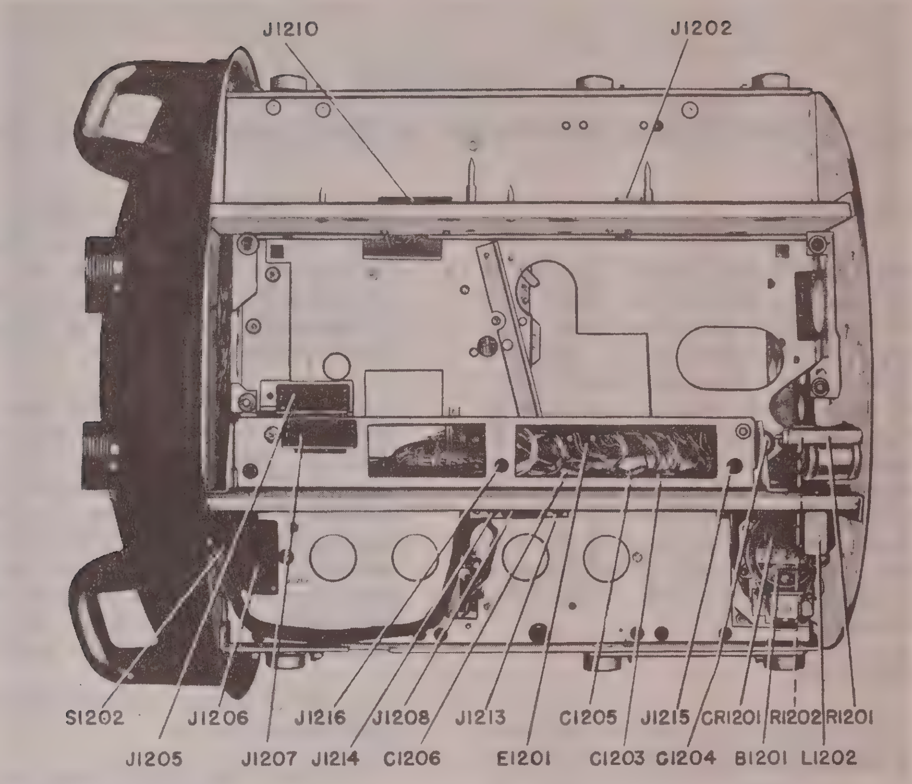

J1210
J1202
S1202
J1206
J1216
J1208
J1213
C1205
J1215
CR1201
R1202
R1201
J1205
J1207
J1214
C1206
E1201
C1203
C1204
B1201
L1202

Figure 17-2. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Bottom, Units Removed

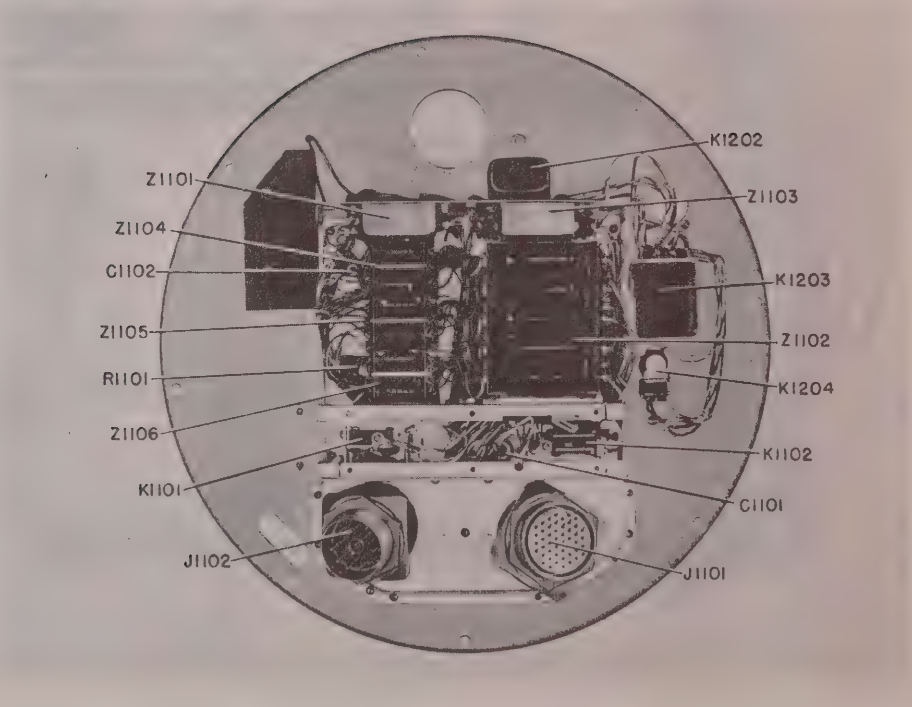

K1202
Z1101
Z1103
Z1104
C1102
K1203
Z1105
Z1102
R1101
K1204
Z1106
K1102
K1101
C1101
J1102
J1101

Figure 17-3. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Front End, Dome Removed

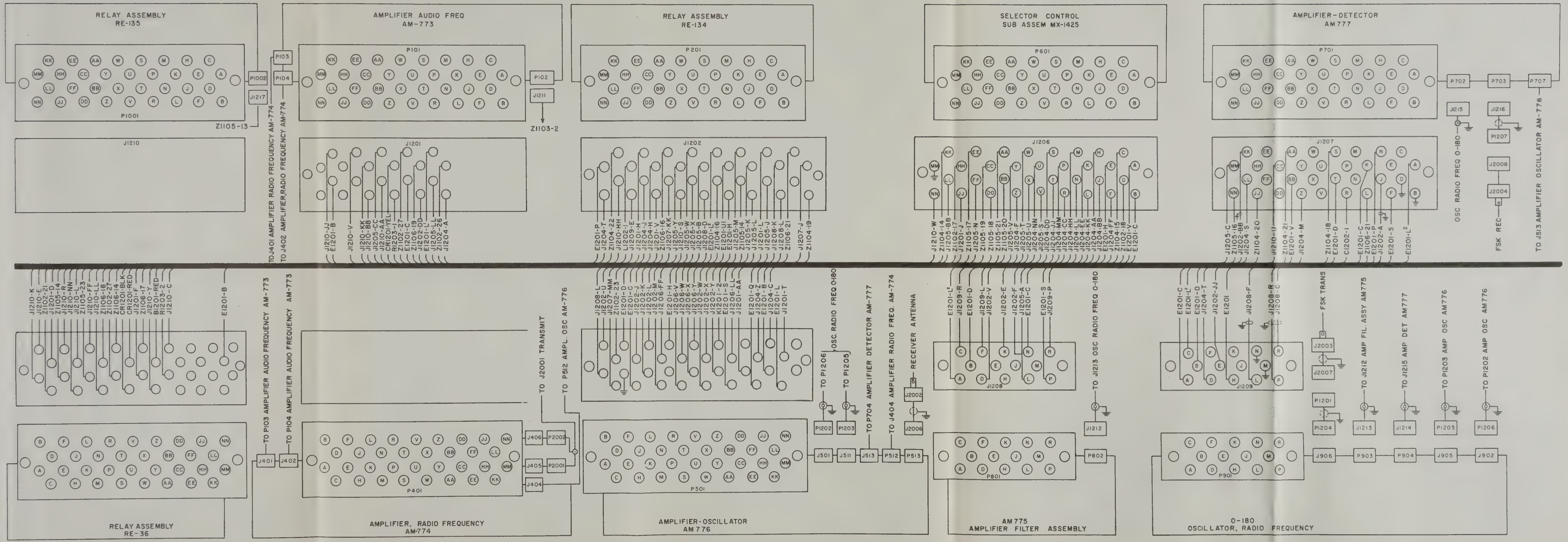
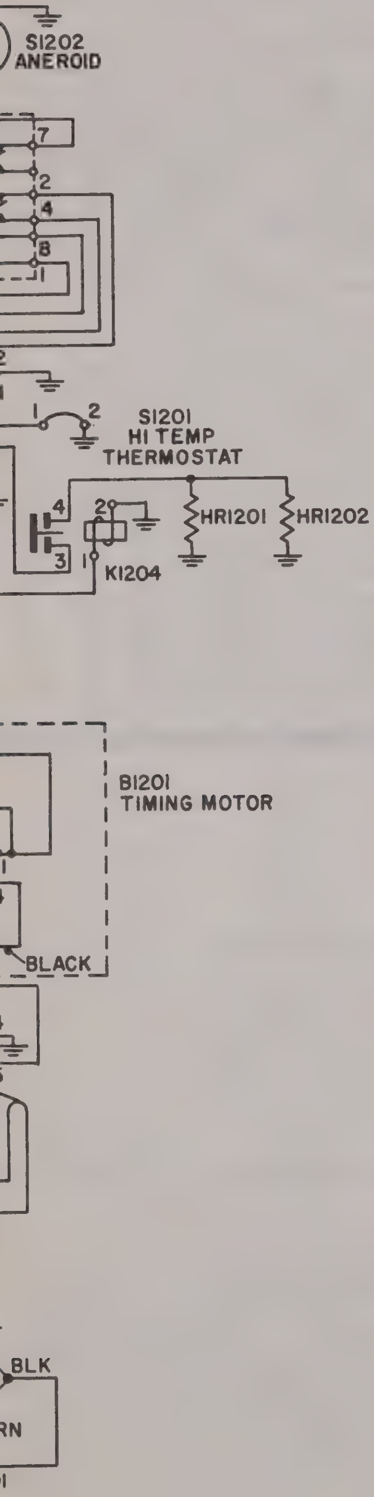

RELAY ASSEMBLY RE-135
P1001
P1002
J1217
Z1105-13
J1210
AMPLIFIER AUDIO FREQ AM-773
P101
P103
P104
P102
J1211
Z1103-2
J1201
TO J401 AMPLIFIER RADIO FREQUENCY AM-774
TO J402 AMPLIFIER, RADIO FREQUENCY AM-774
RELAY ASSEMBLY RE-134
P201
J1202
SELECTOR CONTROL SUB ASSEM MX-1425
P601
J1206
AMPLIFIER-DETECTOR AM777
P701
P702
P703
P707
J1215
J1216
P1207
J2008
J2004
J1207
OSC RADIO FREQ O-180
FSK REC
TO J513 AMPLIFIER OSCILLATOR AM-776
TO P103 AMPLIFIER AUDIO FREQUENCY AM-773
TO P104 AMPLIFIER AUDIO FREQUENCY AM-773
TO J2001 TRANSMIT
TO P512 AMPL. OSC AM-776
TO P1206
TO P1205
OSC. RADIO FREQ O-180
TO P704 AMPLIFIER DETECTOR AM-777
TO J404 AMPLIFIER RADIO FREQ. AM-774
RECEIVER ANTENNA
J2002
J2006
P1202
P1203
J1208
TO J1213 OSC RADIO FREQ O-180
J1212
J1209
FSK TRANS
J2003
J2007
P1201
P1204
TO J1212 AMP FIL ASSY AM775
TO J1215 AMP DET AM777
TO P1203 AMP OSC AM776
TO P1202 AMP OSC AM776
J1213
J1214
P1205
P1206
J401
J402
P401
J406
J405
J404
P2002
P2001
J501
J511
J513
P512
P513
P501
P801
P802
P901
J906
P903
P904
J905
J902
RELAY ASSEMBLY RE-36
AMPLIFIER, RADIO FREQUENCY AM-774
AMPLIFIER-OSCILLATOR AM 776
AM775 AMPLIFIER FILTER ASSEMBLY
O-180 OSCILLATOR, RADIO FREQUENCY

Figure 17-4. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Schematic Diagram (Sheet 1 of 2)


S1202
ANEROID
7
2
4
8
1
1
2
S1201
HI TEMP
THERMOSTAT
4
2
3
1
K1204
HR1201
HR1202
B1201
TIMING MOTOR
BLACK
BLK
RN

CE

CA

W12

W12

W12

CE C

M

2

4

3

02

L C

120

201

120

YE

M

01-

01-

9

01-

1

01-V

3

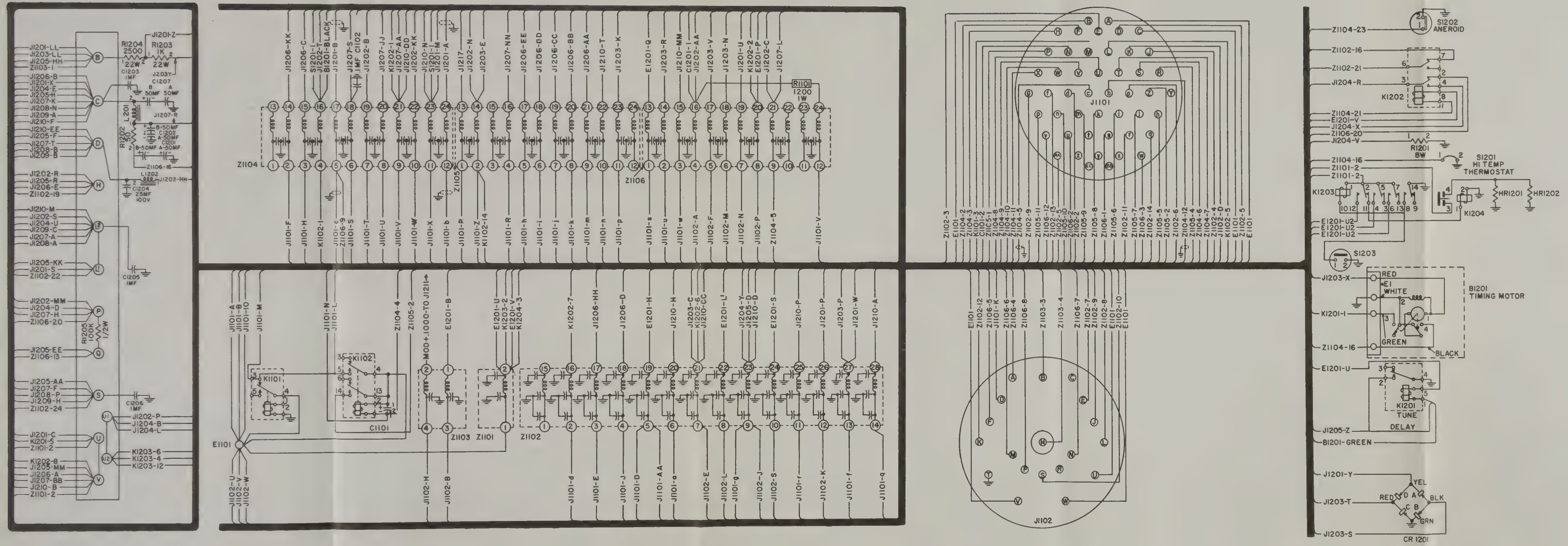
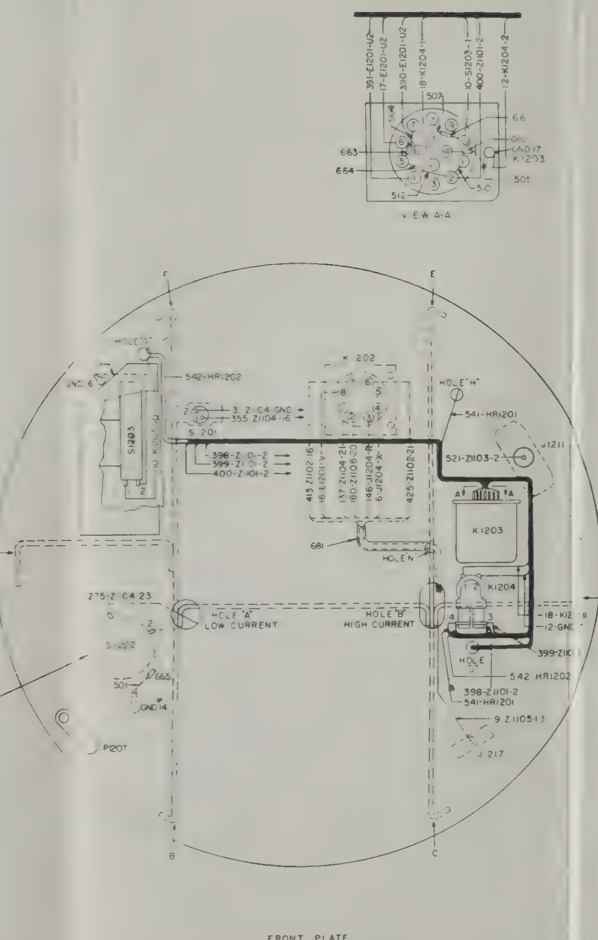

R1204
2500
22W
R1203
1K
22W
C1203
1MF
C1207
L1201
R1202
C1202
C1201
L1202
C1204
25MF
100V
C1205
1MF
R1205
100K
1/2W
C1206
1MF
Z1104
Z1105
Z1106
C1102
1MF
R1101
1200
1W
K1101
K1102
C1101
E1101
MOD+1000-TO J1211
Z1103
Z1101
Z1102
J1101
J1102
S1202
ANEROID
K1202
R1201
8W
S1201
HI TEMP
THERMOSTAT
K1203
K1204
HR1201
HR1202
S1203
RED
WHITE
GREEN
BLACK
B1201
TIMING MOTOR
K1201
TUNE
DELAY
YEL
BLK
GRN
CR 1201

Figure 17-4. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Schematic Diagram (Sheet 2 of 2)


VIEW A-A
K1203
K1204
HOLE "A" LOW CURRENT
HOLE "B" HIGH CURRENT
J1211
P1207
SEE NOTE 3
542-HR1202
541-HR1201

FRONT PLATE
FIG 1

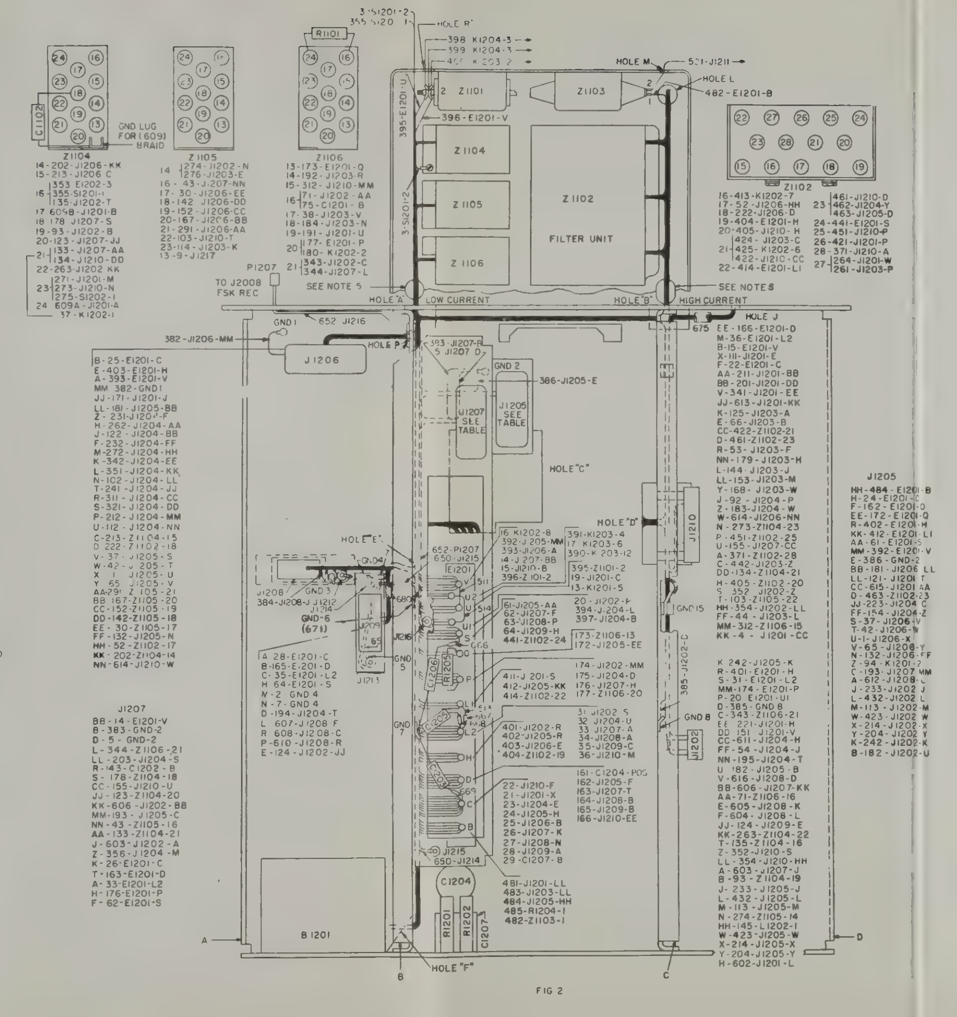

Z1101
Z1102 FILTER UNIT
Z1103
Z1104
Z1105
Z1106
J1206
J1207
J1205
J1208
J1210
J1211
J1212
B1201
HOLE "A" LOW CURRENT
HOLE "B" HIGH CURRENT
HOLE "C"
HOLE "D"
HOLE "E"
HOLE "F"
HOLE M
HOLE L
SEE NOTE 5
SEE NOTE 8
TO J2008 FSK REC
GND LUG FOR P609 BRAID

FIG 2

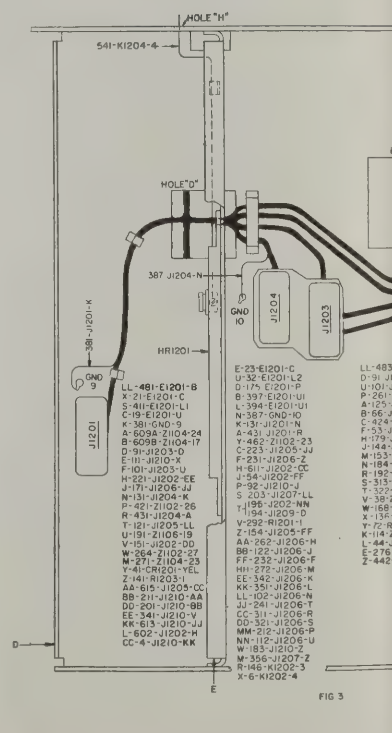

HOLE "H"
HOLE "G"
HOLE "C"
HOLE "D"
SEE NOTE 10
541-K1204-4
542-K1204-4
J1201
J1203
J1204
J1208
HR1201
HR1202
L1201

FIG 3

NOTES

1. FOR REFERENCE ONLY, REMOVABLE CABLES TERMINATE AS FOLLOWS:

CABLE	FROM	TO
W1202	J511	J905
W1203	J501	J902
W1204	J906	J2007

2. FOR REFERENCE ONLY, FIXED CABLES TERMINATE AS FOLLOWS:

FROM	TO
PIC	J1211
P104	J402
P103	J401
P1002	J1217

FROM	TO
P704	J513
P2001	J405
P2002	J406
P512	J404
P1207	J2008
P513	J2006

3. SWITCH TERMINAL CLOSEST TO SHIELD SHALL BE CONNECTED TO GND #14

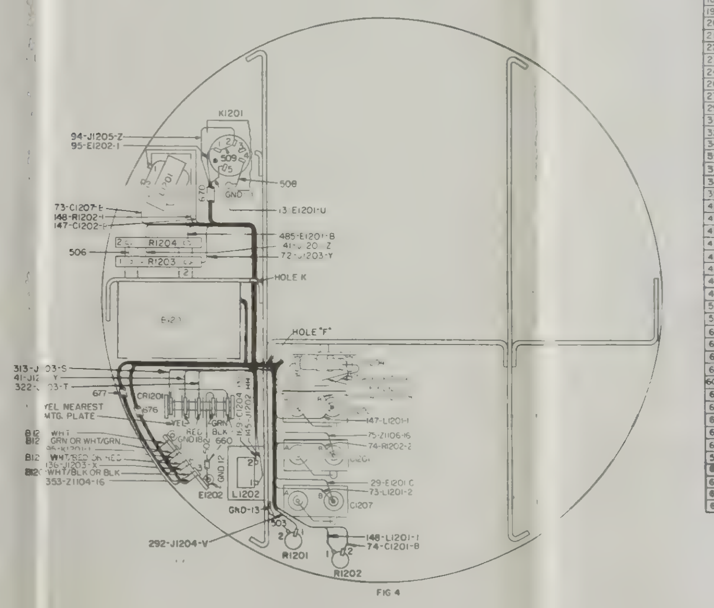

K1201
HOLE "F"
HOLE K
GND-13
GND-14
R1201
R1202
C1207
E1202
94-J1205-Z
95-E1202-1
506
508
292-J1204-V

FIG 4

WIRE TABLE			
WIRE NOS INCLUSIVE	DESCRIPTION COLOR AND CONDUCTOR		
1-12	WHT-BLK TR	AWG24	600V
13-20	BRN TR		
21-30	RED TR		
31-38	ORN TR		
41-44	YEL TR		
52-54	GRN TR		
61-66	BLU TR		
71-75	RED TR		
91-95	BLK/BRN TR		
101-103	BLK/RED TR		
111-114	BLK/GRN TR		
121-125	BRN/RED TR		
131-137	BRN/BLU TR		
141-148	RED/BLK TR		
151-155	RED/GRN TR		
161-163	RED/BLU TR		
171-180	YEL/BLK TR		
181-184	YEL/RED TR		
191-195	YEL/GRN TR		
201-204	GRN/BLK TR		
211-214	GRN/BRN TR		
221-223	GRN/RED TR		
231-233	BLU/BRN TR		
241-242	WHT BLU/BLK TR		
261-264	BLK		
271-276	BRN		
291-292	RED		
311-313	ORN		
321-322	YEL		
341-344	GRN		
351-356	BLU	AWG24	600V
371	WHITE	AWG [illegible]	[illegible]
381-387	WHT-BLK TR		
390-400	BRN TR		
401-405	RED TR		
411-414	ORN TR		
421-425	YEL TR		
431-43[illegible]	GRN TR		
441-44[illegible]	BLU TR	AWG [illegible]	600V
45[illegible]	RED TR	AWG [illegible]	[illegible]
461-463	RED/BLU TR	AWG [illegible]	[illegible]
481-485	WHT-ORN TR	AWG [illegible]	[illegible]
501-514	TINNED COPPER	.032	A
521	WHT-RED TR	AWG 18	[illegible] V
602,6[illegible]	YEL TR (SHIELDED)		
603,6[illegible]	ORN TR		
604,612	BLK TR		
605,613	RED TR		
606,614	BRN TR		
607,615	GRN TR		
608,6[illegible]	[illegible] TR (SHIELDED)		
609A,609B	WHT-BLU TR BRN TR (TWISTED PAIR SHIELDED)		
652	CABLE		
650-65[illegible]	CABLE	WIRE RG 58 U	
541-542	WHT-BRN TR	AWG 18	600V
660-669	SLEEVING INSUL BLK	.042 ID	
670-671	SLEEVING INSUL BLK	.118 ID	
675-677	SLEEVING INSUL BLK	.186 ID	
680-681	SLEEVING INSUL BLK	.208 ID	

Figure 17-5. Chassis, Receiver-Transmitter MX-1424A/ARC-21, Connection Diagram

Z1103: 2-circuit high-voltage, low-current filter.

Z1104, Z1105, Z1106: Three filters of 12 circuits each for low-voltage, low-current leads.

17-7. One medium and five low-current filter elements are available as spares.

17-8. STARTING RELAY SEQUENCE. When turning the "CONTROL" knob on the Radio Set Control C-451A/ARC-21 to "ON" the operator rotates switch S1305 through 60 degrees, corresponding to two contact positions. This closes the master power relay K1704 (when using Power Supply PP-298/ARC-21X), which applies 27.5 volts to motor and relay circuits and 115 volts to the filament transformer, supplying the heater of delay relay K1702.

17-9. The 27.5 volts energize the master trip relay K1101 which trips all the other "CONTROL" switches in the system.

17-10. The take control relay, K1102, closing momentarily at the 30-degree position of the "CONTROL" knob, applies the starting cycle pulse initiating the receiver starting cycle and energizing the timing motor B1201. The tuning cycle start relay K203 in Relay Assembly RE-134A/ARC-21 will normally be locked down by relay K204 since the 27.5 volt a-c heater supply is rectified by CR201. The heater in the thermal delay relay K1702 is also energized to apply plate power to the low voltage and bias rectifier tube V1705, by relay K1601, when the filament has been warmed up.

17-11. After approximately 30 seconds, contacts 2 and 3 will close energizing the auxiliary relay K1201 which will hold in after once closed. This completes the holding circuit which includes relays K502, K503, and the limit switches, and closes relay K504 starting the scanning functions. The timing motor B1201 continues to run until receiver tune-up is completed or a total of 42 seconds has elapsed. At the end of the 42 seconds the timing motor shuts down the equipment by tripping the "CONTROL" knob to the "OFF" position.

17-12. If the timing motor shuts down the equipment a new tuning cycle must be started by turning the "CONTROL" knob to "ON" and waiting the 30 seconds for the timer to again close relay K1201.

17-13. PARTS REMOVAL.

17-14. Replacement of timer B1201 requires the removal of several other items. Use the following procedure:

a. Loosen inductor L1201 in order to reach the timer mounting screws.
b. Loosen inductor L1202 and swing it out of the way.
c. Remove but do not disconnect rectifier CR1201.
d. Remove timer and mounting hardware from the timer.
e. Remove cover and external leads from new timer.
f. Assemble timer leads of chassis cable through grommet from cover of new timer.
g. Connect leads to timer as shown in connection diagram.
h. Remount grommet in cover and cover on timer.
i. Assemble timer on frame, grommet end toward partition, using the following hardware:

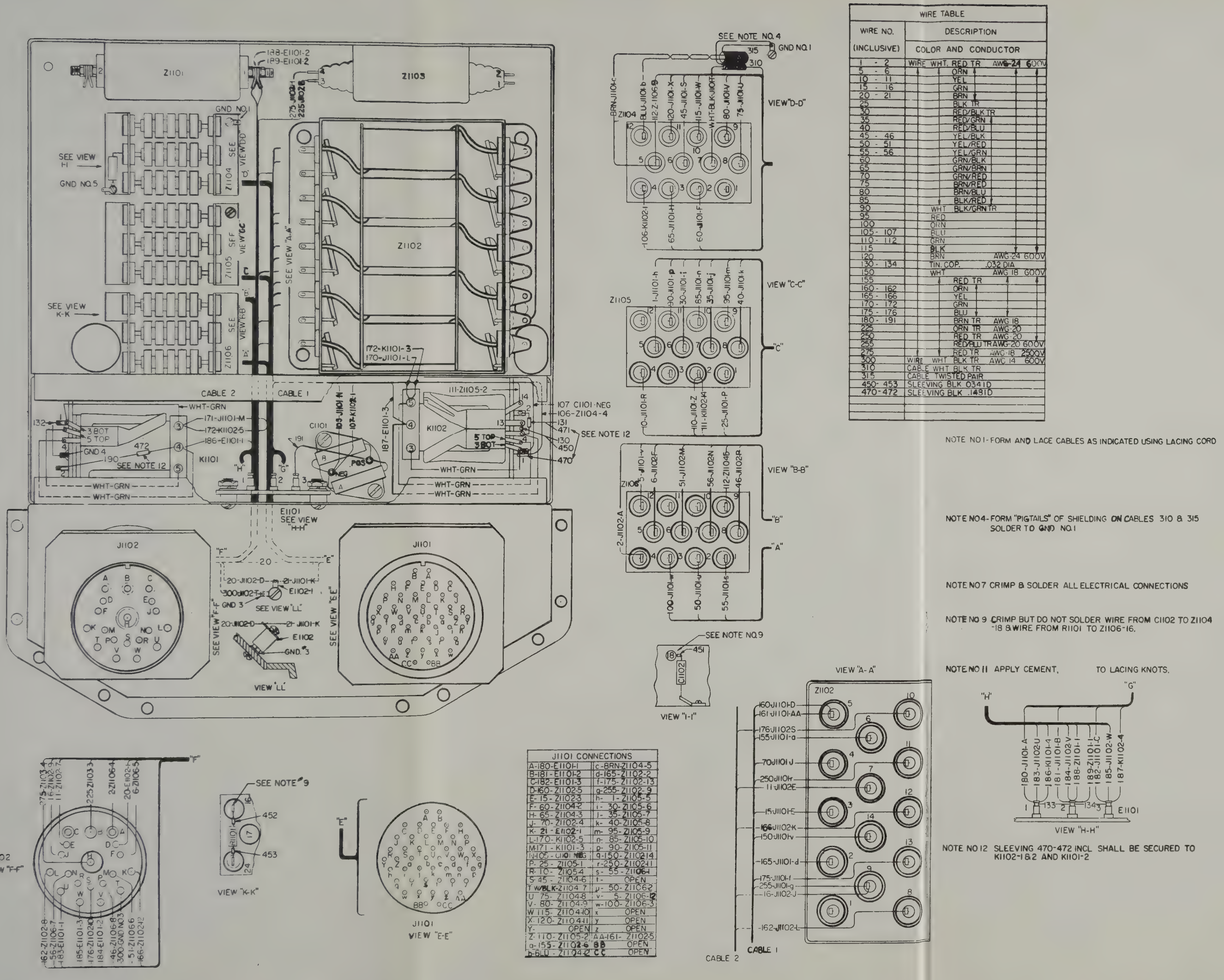
2 Machine screws, flat head 4-40 x 5/16 in.

2 Machine screws, binder head 4-40 x 5/16 in.

2 Flat washers No. 4 stainless steel

2 Lock washers No. 4 stainless steel

Assemble binder head screws and washers in the feet of the timer adjacent to the rear end plate of the chassis, and the flat head screws in the other timer feet.
j. Reassemble the parts loosened or removed.


Z1101
Z1103
Z1102
Z1104
Z1105
Z1106
K1101
K1102
C1101
E1101
J1101
J1102
188-E1101-2
189-E1101-2
GND NO.1
GND NO.5
GND 4
GND 3
SEE VIEW "I-I"
SEE VIEW "K-K"
SEE VIEW "D-D"
SEE VIEW "C-C"
SEE VIEW "B-B"
SEE VIEW "A-A"
SEE VIEW "H-H"
SEE VIEW "LL"
SEE VIEW "F-F"
SEE VIEW "E-E"
CABLE 1
CABLE 2
WHT-GRN
172-K1101-3
170-J1101-L
111-Z1105-2
107 C1101-NEG
106-Z1104-4
171-J1101-M
172-K1102-5
186-E1101-1
SEE NOTE 12
5 TOP
3 BOT
SEE NOTE NO.4
SEE NOTE NO.9
VIEW "D-D"
VIEW "C-C"
VIEW "B-B"
VIEW "A-A"
VIEW "I-I"
VIEW "K-K"
VIEW "LL"
VIEW "H-H"
J1101 VIEW "E-E"
J1102 VIEW "F-F"
20-J1102-D
21-J1101-K
E1102
E1102-1
GND 3

WIRE TABLE	
WIRE NO. (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1 - 2	WIRE WHT. RED TR AWG-24 600V
5 - 6	ORN
10 - 11	YEL
15 - 16	GRN
20 - 21	BRN
25	BLK TR
30	RED/BLK TR
35	RED/GRN
40	RED/BLU
45 - 46	YEL/BLK
50 - 51	YEL/RED
55 - 56	YEL/GRN
60	GRN/BLK
65	GRN/BRN
70	GRN/RED
75	BRN/RED
80	BRN/BLU
85	BLK/RED
90	WHT BLK/GRN TR
95	RED
100	ORN
105 - 107	BLU
110 - 112	GRN
115	BLK
120	BRN AWG-24 600V
130 - 134	TIN. COP. .032 DIA
150	WHT AWG 18 600V
155	RED TR
160 - 162	ORN
165 - 166	YEL
170 - 172	GRN
175 - 176	BLU
180 - 191	BRN TR AWG 18
225	ORN TR AWG-20
250	RED TR AWG-20
255	RED/BLU TR AWG-20 600V
275	RED TR AWG-18 2500V
300	WIRE WHT BLK TR AWC 14 600V
310	CABLE WHT BLK TR
315	CABLE TWISTED PAIR
450 - 453	SLEEVING BLK 0341D
470 - 472	SLEEVING BLK .1491D

NOTE NO 1- FORM AND LACE CABLES AS INDICATED USING LACING CORD

NOTE NO4- FORM "PIGTAILS" OF SHIELDING ON CABLES 310 & 315 SOLDER TO GND NO.1

NOTE NO7 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

NOTE NO 9 CRIMP BUT DO NOT SOLDER WIRE FROM C1102 TO Z1104 -18 & WIRE FROM R1101 TO Z1106-16.

NOTE NO 11 APPLY CEMENT, TO LACING KNOTS.

NOTE NO 12 SLEEVING 470-472 INCL SHALL BE SECURED TO K1102-1 & 2 AND K1101-2

J1101 CONNECTIONS	
A-180-E1101-1	c-BRN-Z1104-5
B-181-E1101-2	d-165-Z1102-2
C-182-E1101-3	f-175-Z1102-13
D-160-Z1102-5	g-255-Z1102-9
E-15-Z1102-3	h- 1-Z1105-5
F-60-Z1104-2	i- 30-Z1105-6
H-65-Z1104-3	j- 35-Z1105-7
J-70-Z1102-4	k- 40-Z1105-8
K-21-E1102-1	m- 95-Z1105-9
L-170-K1102-5	n- 85-Z1105-10
M-171-K1101-3	p- 90-Z1105-11
N-105-C1101 NEG	q-150-Z1102-14
P-25-Z1105-1	r-250-Z1102-11
R-10-Z1105-4	s- 55-Z1106-1
S-45-Z1104-6	t- OPEN
T W/BLK-Z1104 7	u- 50-Z1106-2
U 75-Z1104-8	v- 5-Z1106-12
V-80-Z1104-9	w-100-Z1106-3
W 115-Z1104-10	x OPEN
X-120-Z1104-11	y OPEN
Y- OPEN	z OPEN
Z-110-Z1105-2	AA-161-Z1102-5
a-155-Z1102-6	BB OPEN
b-BLU-Z1104-12	CC OPEN

Figure 17-6. Filter Unit, Connection Diagram

Z1103: 2-circuit high-voltage, low-current filter.

Z1104, Z1105, Z1106: Three filters of 12 circuits each for low-voltage, low-current leads.

17-7. One medium and five low-current filter elements are available as spares.

17-8. STARTING RELAY SEQUENCE. When turning the "CONTROL" knob on the Radio Set Control C-451A/ARC-21 to "ON" the operator rotates switch S1305 through 60 degrees, corresponding to two contact positions. This closes the master power relay K1704 (when using Power Supply PP-298/ARC-21X), which applies 27.5 volts to motor and relay circuits and 115 volts to the filament transformer, supplying the heater of delay relay K1702.

17-9. The 27.5 volts energize the master trip relay K1101 which trips all the other "CONTROL" switches in the system.

17-10. The take control relay, K1102, closing momentarily at the 30-degree position of the "CONTROL" knob, applies the starting cycle pulse initiating the receiver starting cycle and energizing the timing motor B1201. The tuning cycle start relay K203 in Relay Assembly RE-134A/ARC-21 will normally be locked down by relay K204 since the 27.5 volt a-c heater supply is rectified by CR201. The heater in the thermal delay relay K1702 is also energized to apply plate power to the low voltage and bias rectifier tube V1705, by relay K1601, when the filament has been warmed up.

17-11. After approximately 30 seconds, contacts 2 and 3 will close energizing the auxiliary relay K1201 which will hold in after once closed. This completes the holding circuit which includes relays K502, K503, and the limit switches, and closes relay K504 starting the scanning functions. The timing motor B1201 continues to run until receiver tune-up is completed or a total of 42 seconds has elapsed. At the end of the 42 seconds the timing motor shuts down the equipment by tripping the "CONTROL" knob to the "OFF" position.

17-12. If the timing motor shuts down the equipment a new tuning cycle must be started by turning the "CONTROL" knob to "ON" and waiting the 30 seconds for the timer to again close relay K1201.

17-13. PARTS REMOVAL.

17-14. Replacement of timer B1201 requires the removal of several other items. Use the following procedure:

a. Loosen inductor L1201 in order to reach the timer mounting screws.
b. Loosen inductor L1202 and swing it out of the way.
c. Remove but do not disconnect rectifier CR1201.
d. Remove timer and mounting hardware from the timer.
e. Remove cover and external leads from new timer.
f. Assemble timer leads of chassis cable through grommet from cover of new timer.
g. Connect leads to timer as shown in connection diagram.
h. Remount grommet in cover and cover on timer.
i. Assemble timer on frame, grommet end toward partition, using the following hardware:

2 Machine screws, flat head 4-40 x 5/16 in.

2 Machine screws, binder head 4-40 x 5/16 in.

2 Flat washers No. 4 stainless steel

2 Lock washers No. 4 stainless steel

Assemble binder head screws and washers in the feet of the timer adjacent to the rear end plate of the chassis, and the flat head screws in the other timer feet.
j. Reassemble the parts loosened or removed.

SECTION XVIII

MAINTENANCE INSTRUCTIONS FOR CASE, RECEIVER-TRANSMITTER CY-1279A/ARC-21

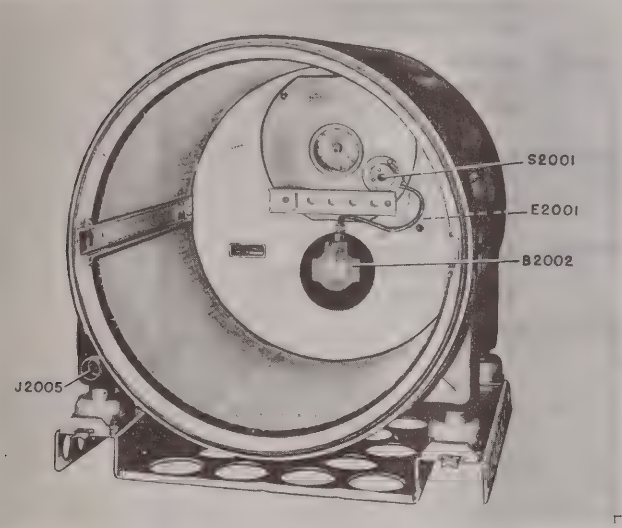

S2001
E2001
B2002
J2005

Figure 18-1. Case, Receiver-Transmitter CY-1279A/ARC-21, Inside

18-1. TROUBLE ANALYSIS.

18-2. Use the schematic diagram, figure 18-4, as a guide for circuit check and the wiring diagram, figure 18-5, to indicate the parts locations and cable layouts.

18-3. LUBRICATION.

18-4. Every 500 hours, lubricate bearings of blower motors B2001 and B2002 as follows:

a. Blow out all brush dust.
b. Clean out old grease.
c. Hand pack bearings with grease, MIL-G-3278.

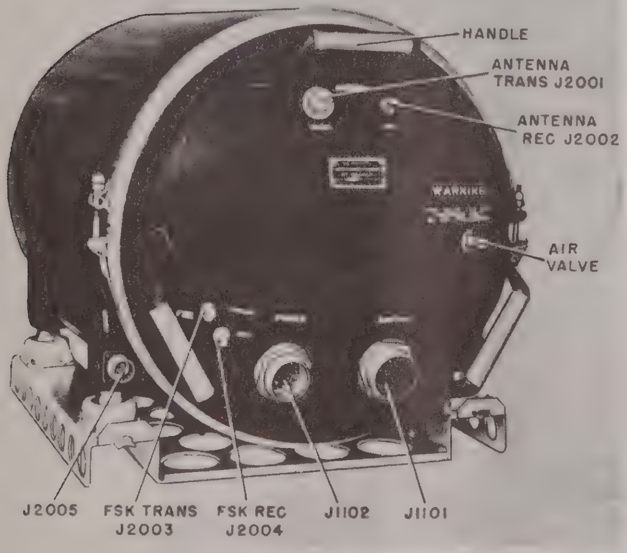

HANDLE
ANTENNA TRANS J2001
ANTENNA REC J2002
AIR VALVE
J2005
FSK TRANS J2003
FSK REC J2004
J1102
J1101

Figure 18-2. Case, Receiver-Transmitter CY-1279A/ARC-21, Front

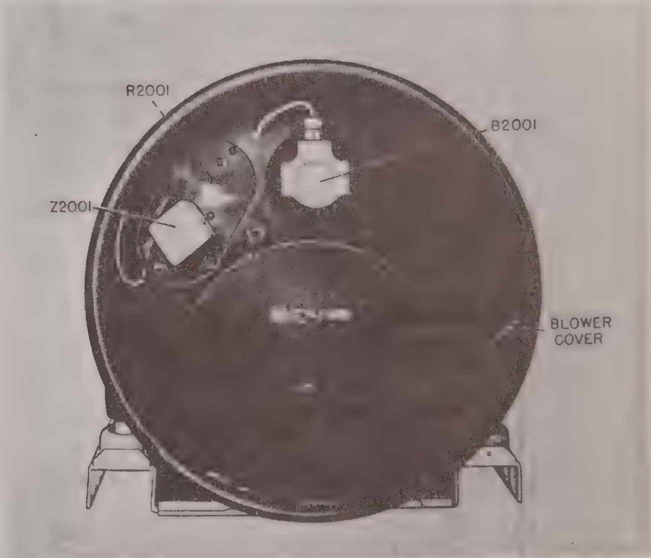

R2001
B2001
Z2001
BLOWER COVER

Figure 18-3. Case, Receiver-Transmitter CY-1279A/ARC-21, Rear

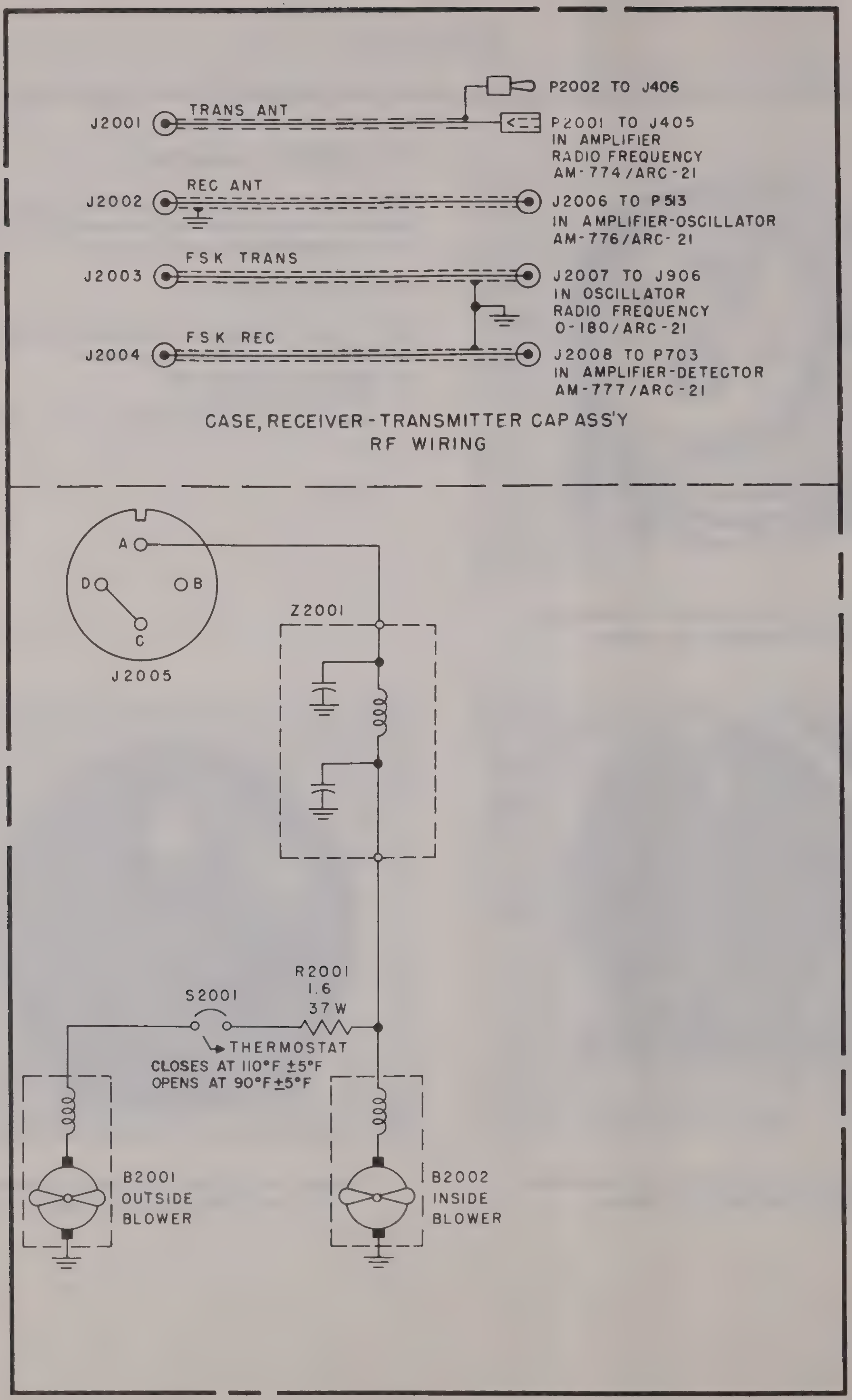
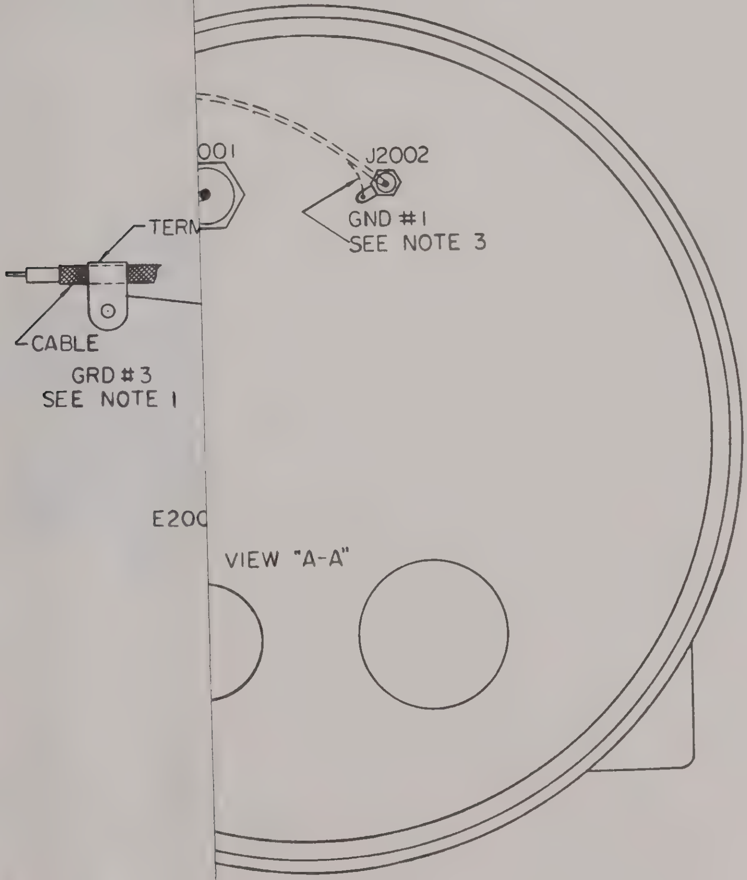

P2002 TO J406
TRANS ANT
J2001
P2001 TO J405
IN AMPLIFIER
RADIO FREQUENCY
AM-774/ARC-21
REC ANT
J2002
J2006 TO P513
IN AMPLIFIER-OSCILLATOR
AM-776/ARC-21
FSK TRANS
J2003
J2007 TO J906
IN OSCILLATOR
RADIO FREQUENCY
O-180/ARC-21
FSK REC
J2004
J2008 TO P703
IN AMPLIFIER-DETECTOR
AM-777/ARC-21
CASE, RECEIVER-TRANSMITTER CAP ASS'Y
RF WIRING
A
D
B
C
J2005
Z2001
R2001
1.6
37 W
S2001
THERMOSTAT
CLOSES AT 110°F ±5°F
OPENS AT 90°F ±5°F
B2001
OUTSIDE
BLOWER
B2002
INSIDE
BLOWER

Figure 18-4. Case, Receiver-Transmitter CY-1279A/ARC-21, Schematic Diagram

TABLE

DESCRIPTION
AND CONDUCTOR
N 16/010 3000V AC
IT. BRN. TR. 26/.010 300V.
S TIN. COP. .040 DIA.
CO-AX (W 2001)
CO-AX RG-58/U
NG, BLK. .106 I.D.
NG, BLK. .042 I.D.
IA CONNECTOR
NG, BLK. .133 I.D.


001
J2002
GND #1
SEE NOTE 3
TERM
CABLE
GRD #3
SEE NOTE 1
E200
VIEW "A-A"

NOTE 1 CUT OFF PIGTAIL AND THEN SOLDER, TERMINAL TO BLOWER LEAD SHIELD

NOTE 2 TIE WIRES WHERE INDICATED.

NOTE 3 SOLDER "PIGTAIL" OF WIRE # 31 TO GND #1

NOTE 4 SOLDER "PIGTAIL" OF WIRES #41 & 42 TO GND #2. SHIELDED BRAID SHALL BE APPOX. 3/4 IN. FROM THE END OF THE POLYETHYLENE.

smitter CY-1279A/ARC-21, Connection Diagram

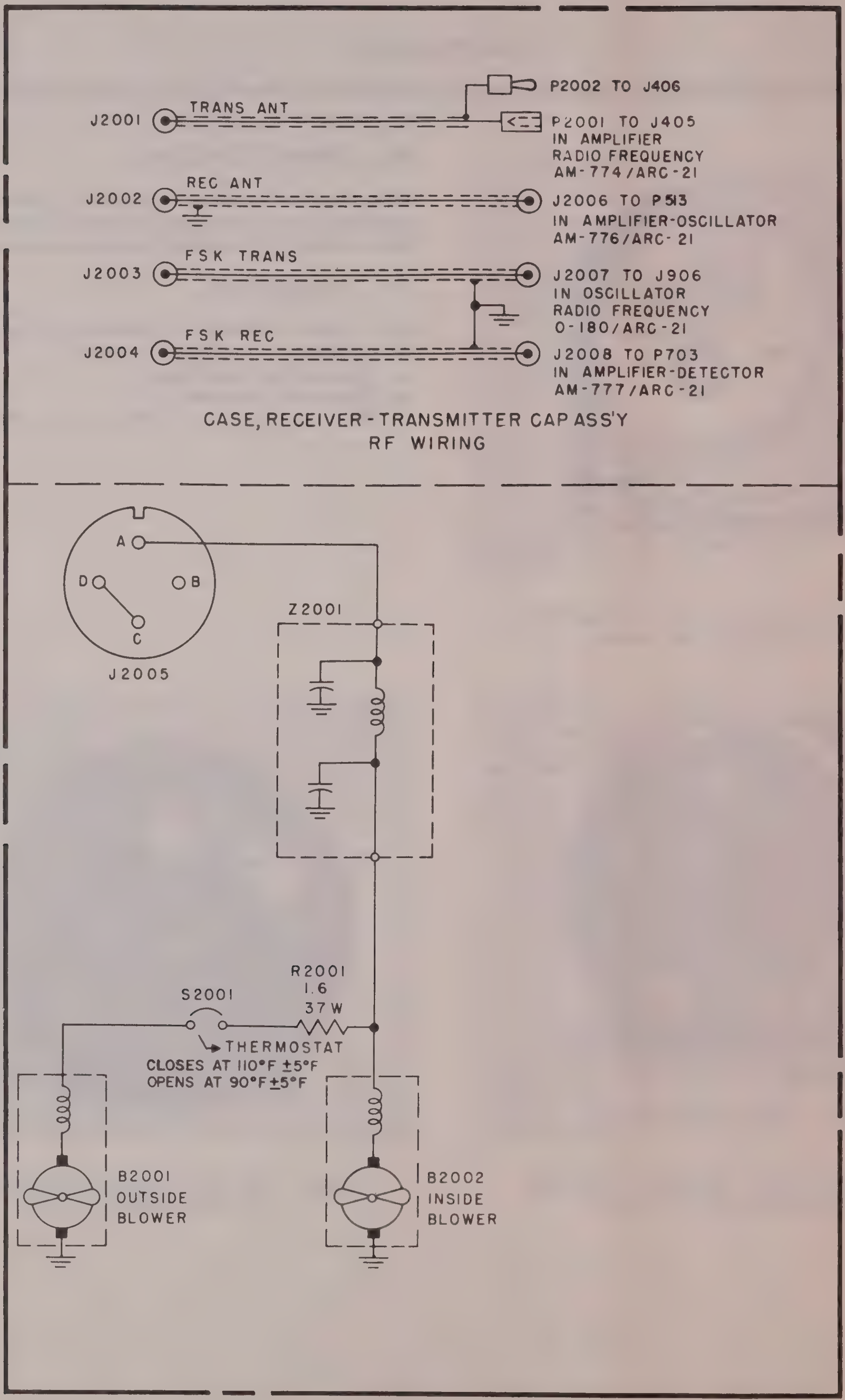
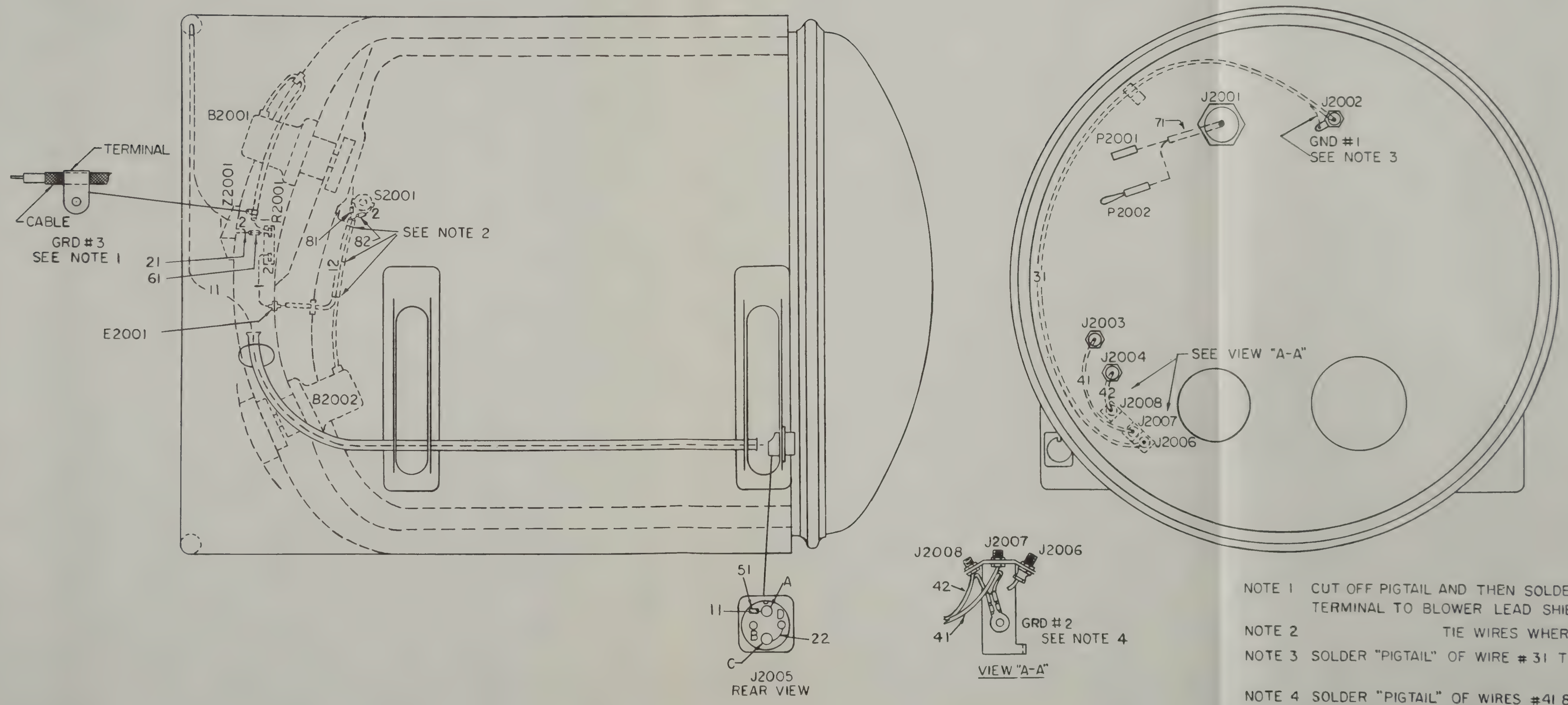

P2002 TO J406
J2001
TRANS ANT
P2001 TO J405
IN AMPLIFIER
RADIO FREQUENCY
AM-774/ARC-21
J2002
REC ANT
J2006 TO P513
IN AMPLIFIER-OSCILLATOR
AM-776/ARC-21
J2003
FSK TRANS
J2007 TO J906
IN OSCILLATOR
RADIO FREQUENCY
O-180/ARC-21
J2004
FSK REC
J2008 TO P703
IN AMPLIFIER-DETECTOR
AM-777/ARC-21
CASE, RECEIVER-TRANSMITTER CAP ASS'Y
RF WIRING
A
D
B
C
J2005
Z2001
R2001
1.6
37 W
S2001
THERMOSTAT
CLOSES AT 110°F ±5°F
OPENS AT 90°F ±5°F
B2001
OUTSIDE
BLOWER
B2002
INSIDE
BLOWER

Figure 18-4. Case, Receiver-Transmitter CY-1279A/ARC-21, Schematic Diagram

WIRE TABLE	
WIRE NO. (INCLUSIVE)	DESCRIPTION
	COLOR AND CONDUCTOR
1	WIRE BRN 16/010 3000V AC
11–12	WIRE WHT. BRN. TR. 26/.010 300V.
21–22	WIRE BUS TIN. COP. .040 DIA.
31	CABLE CO-AX (W 2001)
41–42	CABLE CO-AX RG-58/U
51	SLEEVING, BLK. .106 I.D.
61	SLEEVING, BLK. .042 I.D.
71	ANTENNA CONNECTOR
81–82	SLEEVING, BLK. .133 I.D.



TERMINAL
CABLE
GRD #3
SEE NOTE 1
B2001
Z2001
R2001
S2001
2
81
82
SEE NOTE 2
21
61
11
12
E2001
B2002
51
A
11
D
B
C
22
J2005
REAR VIEW
J2001
J2002
71
P2001
P2002
GND #1
SEE NOTE 3
31
J2003
J2004
41
42
SEE VIEW "A-A"
J2008
J2007
J2006
GRD #2
SEE NOTE 4
VIEW "A-A"

NOTE 1 CUT OFF PIGTAIL AND THEN SOLDER, TERMINAL TO BLOWER LEAD SHIELD

NOTE 2 TIE WIRES WHERE INDICATED.

NOTE 3 SOLDER "PIGTAIL" OF WIRE # 31 TO GND #1

NOTE 4 SOLDER "PIGTAIL" OF WIRES #41 & 42 TO GND #2. SHIELDED BRAID SHALL BE APPOX. 3/4 IN. FROM THE END OF THE POLYETHYLENE.

Figure 18-5. Case, Receiver-Transmitter CY-1279A/ARC-21, Connection Diagram

SECTION XIX

MAINTENANCE INSTRUCTIONS FOR RADIO SET CONTROL C-451A/ARC-21

19-1. TROUBLE ANALYSIS.

19-2. GENERAL. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

19-3. CLEANING AND INSPECTION. A defective unit should first be examined carefully for loose or broken parts. Drum-actuated and rotary-switch contacts that are dirty or discolored should be cleaned with carbon tetrachloride applied with a small brush. Check for free rotation of the "CHANNEL" control knob.

19-4. PRELIMINARY CHECK. With the radio set control disconnected and using a Multimeter TS-352/U, perform the following circuit checks:

a. Using tables XCII and XCIII check the resistance to ground from pins of the connecting jacks.

b. Connect TS-352/U between center and one outside terminal of R1302, R1303A, R1303B, and R1304 in turn. Rotate each control and note if resistance varies smoothly and shake knob to test for poor contacts.

c. D-c resistance of coil windings of B1301, K1301, and K1302: B1301 = 7.82 ohms, K1301 = 365 ohms, K1302 = 14.4 ohms.

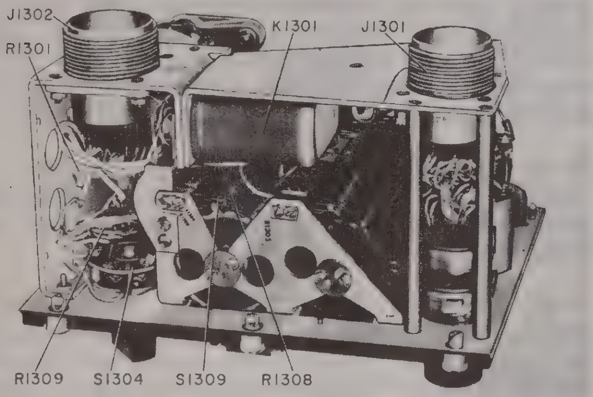


Figure 19-1. Radio Set Control C-451A/ARC-21, Left Side

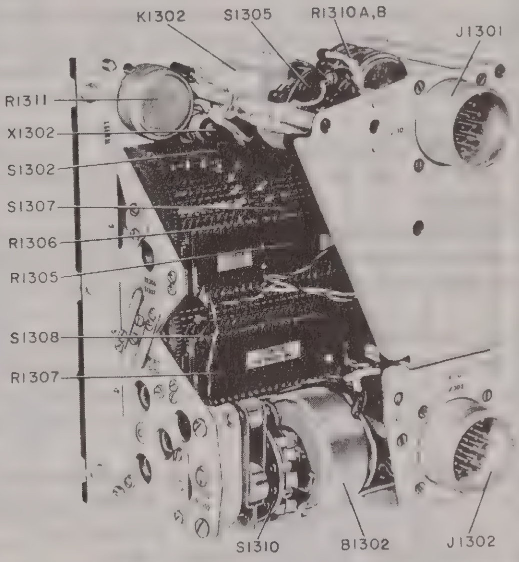


Figure 19-2. Radio Set Control C-451A/ARC-21, Rear

TABLE XCI. REISTANCE IN OHMS, PINS TO GROUND, JACK J1301

Conditions: All cables disconnected. Meter negative grounded. "CHANNEL" at "10" frequency, 10503 kc. "CONTROL" "OFF", "CW TUNE" max., "NOISE" max., "POWER" "LOW" and "VOICE."

Pin Reading	A 85	B 15	C 15	D *	E *	F *	G *	H 32	I 32
Pin Reading	J 120	K 32	L 32	M 32	N 0				

*Infinite resistance value.

TABLE XCII. RESISTANCE IN OHMS, PINS TO GROUND, JACK J1302

Pin Reading	A 9000	B 14.5	C 0	D *	E *	F *	G *	H *	J *	K *
Pin Reading	L *	M *	N *	P *	R *	S *	T *	U *	V *	

*Infinite resistance value.

19-5. OPERATIONAL CHECK. If the above checks fail to locate trouble, the unit should be given an operational test. Cable the unit into a setup and proceed as follows:

a. Set the controls for "VOICE" operation, "POWER" at "HI."

b. Set up the frequency channels so that starting at channel 1 all buttons are at the extreme left, or lowest frequency position, and for each succeeding channel they are placed one point to the right. Record each frequency setting. For channel 11, the hundreds and tens buttons can start at the left again. The effect of this setting is to cause every contact on the bridge resistors to be actuated at least once in a series of 20 frequency settings except for the thousands selections where the last two positions must be checked separately.

c. Set "CHANNEL" switch at 1 and move "CONTROL" to "ON."

d. Observe the action of the switches in the AM-775A/ARC-21 and O-180A/ARC-21 unit and note if they agree with recorded frequency for channel 1. Continue with all 20 channels, checking each frequency setting.

e. If the switches check satisfactorily, set buttons for 22 and 23 mc on thousands selector and check these settings.

f. Should one switch set incorrectly, one or more of the resistors associated with the frequency selector drum is open or shorted.

19-6. SELECTOR DRUM MOTOR CHECK. When Radio Set Control C-455/ARC units are used in the system and are available in the test setup, the operation of the ratchet motor drive can be checked as follows:

a. With unit cabled into the system, set controls for "VOICE" operation, "POWER" at "LOW" and "CONTROL" to "ON." Set "CHANNEL" to position 1.

b. On C-455/ARC set "CHANNEL" to 1.

c. Rotate "CONTROL" on C-455/ARC to "ON" and note if "CONTROL" on C451/ARC-21 is tripped to "OFF."

d. Rotate "CHANNEL" on C-455/ARC to each channel position in sequence. "CHANNEL" switch on C-451A/ARC-21 should set up in synchronism. Failure to operate indicates a defective ratchet motor B1301, switch S1301, relay K1301 or switch S1303.

19-7. RESISTOR CHECK. To locate a resistor at fault, determine the position of the frequency setting controlled by the defective switch, that is, thousands, hundreds, tens, or units. Then proceed as follows:

a. Disconnect the cable from J1301.

b. Connect a Multimeter TS-352/U to the proper pins in J1301 for the different groups as follows:

Thousands	H and I
Hundreds	H and J
Tens	H and K
Units	H and L

c. With frequency selection set up as described in paragraph 19-5, step b, start at channel 1 and rotate "CHANNEL" switch to each channel in turn. Refer to schematic diagram, figure 19-3, for value of each resistor switched in at succeeding channel positions.

19-8. CIRCUIT ANALYSIS.

19-9. GENERAL. This unit contains the facilities for presetting 20 frequency channels and for complete control and operation of the equipment.

19-10. CHANNEL SELECTION. To change channels from the Radio Set Control C-455/ARC, a servo system is used, driving the drums by a ratchet motor, B1301. The remote control system consists of a remote switch, S1401, front and rear, setting up one of 20 possible combinations on a five-wire interconnecting cable. The local switch, S1303, front and rear, will open the circuit to relay K1301 in only one position, that relative to the channel chosen.

19-11. When the remote "CHANNEL" selector is changed, relay K1301 is energized through the five-wire coding system, a ground is completed through the rotor contact of switch S1303 front, closing the relay. The relay now has its ground completed also through terminals 9 and 10 of switch S1310 front, and contacts 2 and 12 of the relay. The ratchet motor, B1301, is energized through contacts 4 and 5 of the relay K1301. The receiver tuning start pulse is applied through contacts 6 and 7 of the relay K1301.

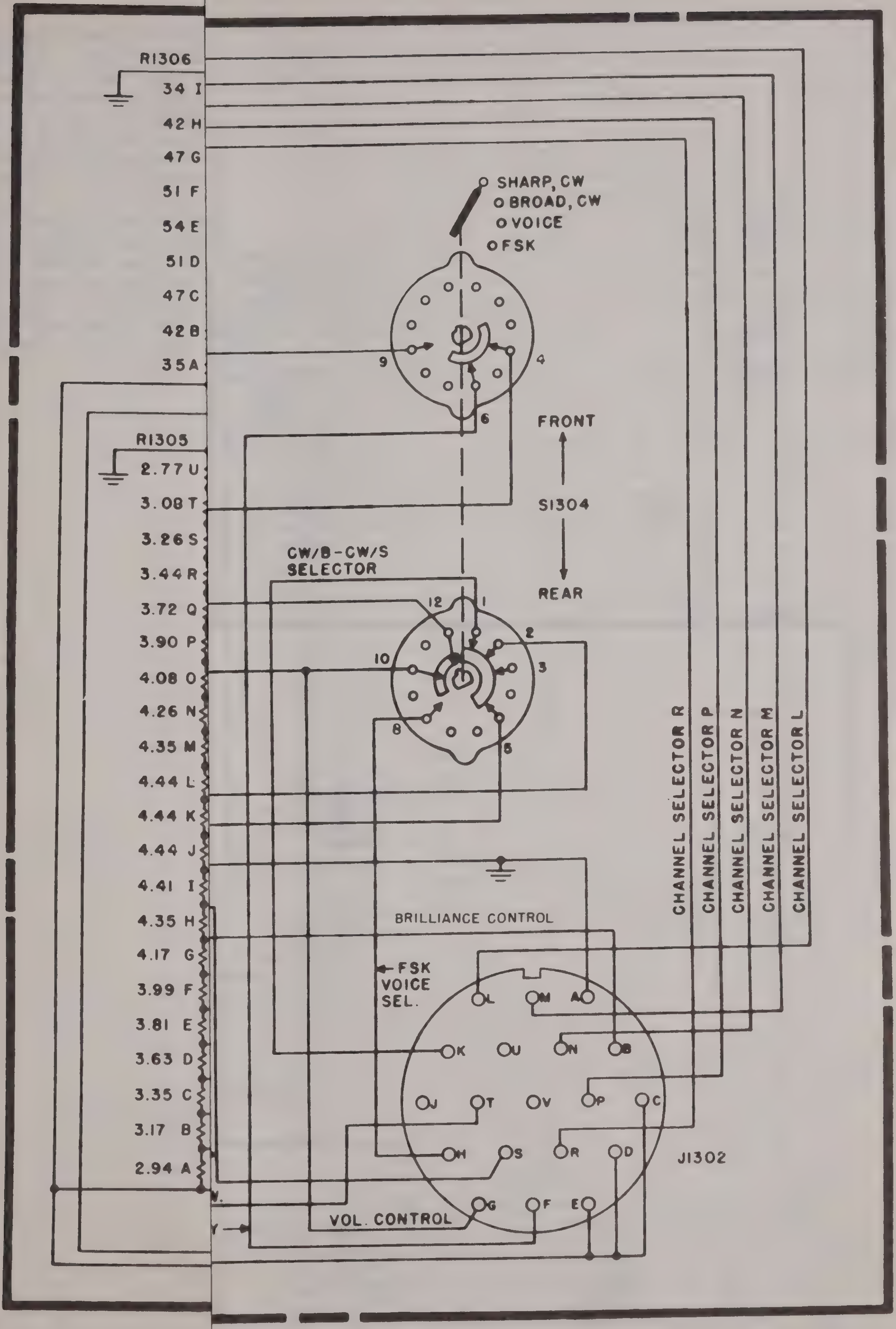
19-12. During each cycle the drums move from one channel to the adjoining channel. The cycling continues until switch S1303 finds an open circuit, disabling the ratchet motor circuits.

19-13. DOOR INTERLOCK S1302. Door interlock switch, S1302, opens when the upper access door on the front panel is opened to permit setting of the drum buttons. This prevents operation of the remote channel selector circuits by opening the supply voltage circuit to relay K1301 and prevents the tuning cycle starting by opening the circuit of the pulse switch S1309.

19-14. "CONTROL" SWITCH S1305. The "CONTROL" switch operates through an arc of 60 degrees or through one switch position to the third position. When the switch is operated, a momentary contact is made at terminal 2 through terminal 10 to ground to trip the remote take control trip mechanisms. Contacts 10 and 11 energize the on-off master switch.

19-15. At the full 60-degree "ON" position terminals 7, 8, 11, and 12 are closed, connecting the "NOISE" control, resistor R1302, the "VOLUME" control, R1303A, and the "POWER" switch, S1306, in the master on-off circuit. The rear of switch S1305 connects the audio section of the "VOLUME" control, resistor R1303B, in the audio circuit. The "CW SHARP-CW BROAD-VOICE-FSK" switch, S1304, completes the "VOLUME" and "NOISE" control circuits. The trip coil, K1302, is energized momentarily when another operating position "CONTROL" switch is turned to "ON" causing the switch to return to the "OFF" position.

19-16. "CW SHARP-CW BROAD-VOICE-FSK" SWITCH, S1304. This is a function selector switch


R1306
34 I
42 H
47 G
51 F
54 E
51 D
47 C
42 B
35 A
R1305
2.77 U
3.08 T
3.26 S
3.44 R
3.72 Q
3.90 P
4.08 O
4.26 N
4.35 M
4.44 L
4.44 K
4.44 J
4.41 I
4.35 H
4.17 G
3.99 F
3.81 E
3.63 D
3.35 C
3.17 B
2.94 A
SHARP, CW
BROAD, CW
VOICE
FSK
9
4
6
FRONT
S1304
REAR
CW/B-CW/S SELECTOR
12
1
2
3
10
8
5
CHANNEL SELECTOR R
CHANNEL SELECTOR P
CHANNEL SELECTOR N
CHANNEL SELECTOR M
CHANNEL SELECTOR L
BRILLIANCE CONTROL
FSK VOICE SEL.
L
M
A
K
U
N
B
J
T
V
P
C
H
S
R
D
G
F
E
J1302
W
Y
VOL. CONTROL

Radio Set Control C-451A/ARC-21, Schematic Diagram

19-5. **OPERATIONAL CHECK.** If the above checks fail to locate trouble, the unit should be given an operational test. Cable the unit into a setup and proceed as follows:

a. Set the controls for "VOICE" operation, "POWER" at "HI."

b. Set up the frequency channels so that starting at channel 1 all buttons are at the extreme left, or lowest frequency position, and for each succeeding channel they are placed one point to the right. Record each frequency setting. For channel 11, the hundreds and tens buttons can start at the left again. The effect of this setting is to cause every contact on the bridge resistors to be actuated at least once in a series of 20 frequency settings except for the thousands selections where the last two positions must be checked separately.

c. Set "CHANNEL" switch at 1 and move "CONTROL" to "ON."

d. Observe the action of the switches in the AM-775A/ARC-21 and O-180A/ARC-21 unit and note if they agree with recorded frequency for channel 1. Continue with all 20 channels, checking each frequency setting.

e. If the switches check satisfactorily, set buttons for 22 and 23 mc on thousands selector and check these settings.

f. Should one switch set incorrectly, one or more of the resistors associated with the frequency selector drum is open or shorted.

19-6. **SELECTOR DRUM MOTOR CHECK.** When Radio Set Control C-455/ARC units are used in the system and are available in the test setup, the operation of the ratchet motor drive can be checked as follows:

a. With unit cabled into the system, set controls for "VOICE" operation, "POWER" at "LOW" and "CONTROL" to "ON." Set "CHANNEL" to position 1.

b. On C-455/ARC set "CHANNEL" to 1.

c. Rotate "CONTROL" on C-455/ARC to "ON" and note if "CONTROL" on C451/ARC-21 is tripped to "OFF."

d. Rotate "CHANNEL" on C-455/ARC to each channel position in sequence. "CHANNEL" switch on C-451A/ARC-21 should set up in synchronism. Failure to operate indicates a defective ratchet motor B1301, switch S1301, relay K1301 or switch S1303.

19-7. **RESISTOR CHECK.** To locate a resistor at fault, determine the position of the frequency setting controlled by the defective switch, that is, thousands, hundreds, tens, or units. Then proceed as follows:

a. Disconnect the cable from J1301.

b. Connect a Multimeter TS-352/U to the proper pins in J1301 for the different groups as follows:

Thousands	H and I
Hundreds	H and J
Tens	H and K
Units	H and L

c. With frequency selection set up as described in paragraph 19-5, step b, start at channel 1 and rotate "CHANNEL" switch to each channel in turn. Refer to schematic diagram, figure 19-3, for value of each resistor switched in at succeeding channel positions.

19-8. CIRCUIT ANALYSIS.

19-9. **GENERAL.** This unit contains the facilities for presetting 20 frequency channels and for complete control and operation of the equipment.

19-10. **CHANNEL SELECTION.** To change channels from the Radio Set Control C-455/ARC, a servo system is used, driving the drums by a ratchet motor, B1301. The remote control system consists of a remote switch, S1401, front and rear, setting up one of 20 possible combinations on a five-wire interconnecting cable. The local switch, S1303, front and rear, will open the circuit to relay K1301 in only one position, that relative to the channel chosen.

19-11. When the remote "CHANNEL" selector is changed, relay K1301 is energized through the five-wire coding system, a ground is completed through the rotor contact of switch S1303 front, closing the relay. The relay now has its ground completed also through terminals 9 and 10 of switch S1310 front, and contacts 2 and 12 of the relay. The ratchet motor, B1301, is energized through contacts 4 and 5 of the relay K1301. The receiver tuning start pulse is applied through contacts 6 and 7 of the relay K1301.

19-12. During each cycle the drums move from one channel to the adjoining channel. The cycling continues until switch S1303 finds an open circuit, disabling the ratchet motor circuits.

19-13. **DOOR INTERLOCK S1302.** Door interlock switch, S1302, opens when the upper access door on the front panel is opened to permit setting of the drum buttons. This prevents operation of the remote channel selector circuits by opening the supply voltage circuit to relay K1301 and prevents the tuning cycle starting by opening the circuit of the pulse switch S1309.

19-14. **"CONTROL" SWITCH S1305.** The "CONTROL" switch operates through an arc of 60 degrees or through one switch position to the third position. When the switch is operated, a momentary contact is made at terminal 2 through terminal 10 to ground to trip the remote take control trip mechanisms. Contacts 10 and 11 energize the on-off master switch.

19-15. At the full 60-degree "ON" position terminals 7, 8, 11, and 12 are closed, connecting the "NOISE" control, resistor R1302, the "VOLUME" control, R1303A, and the "POWER" switch, S1306, in the master on-off circuit. The rear of switch S1305 connects the audio section of the "VOLUME" control, resistor R1303B, in the audio circuit. The "CW SHARP-CW BROAD-VOICE-FSK" switch, S1304, completes the "VOLUME" and "NOISE" control circuits. The trip coil, K1302, is energized momentarily when another operating position "CONTROL" switch is turned to "ON" causing the switch to return to the "OFF" position.

19-16. **"CW SHARP-CW BROAD-VOICE-FSK" SWITCH, S1304.** This is a function selector switch

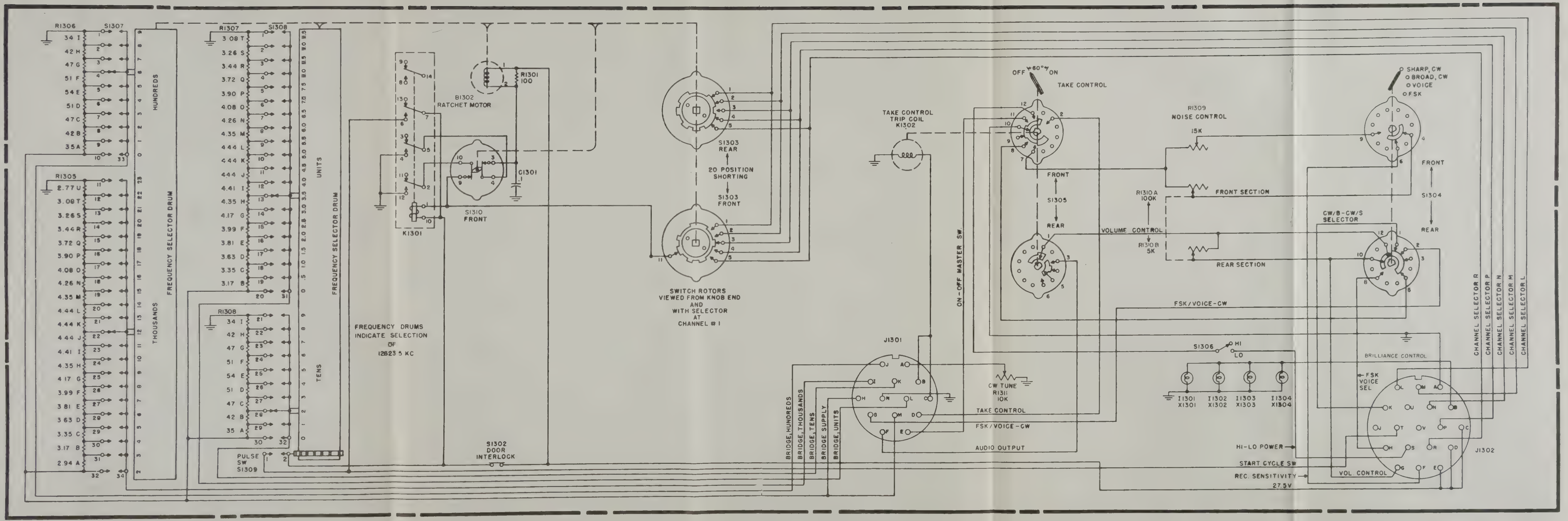

R1306
S1307
HUNDREDS
R1305
FREQUENCY SELECTOR DRUM
THOUSANDS
R1307
S1308
UNITS
R1308
TENS
FREQUENCY SELECTOR DRUM
PULSE SW S1309
S1302 DOOR INTERLOCK
FREQUENCY DRUMS INDICATE SELECTION OF 12823.5 KC
K1301
B1302 RATCHET MOTOR
R1301 100
C1301
S1310 FRONT
S1303 REAR
20 POSITION SHORTING
S1303 FRONT
SWITCH ROTORS VIEWED FROM KNOB END AND WITH SELECTOR AT CHANNEL #1
TAKE CONTROL TRIP COIL K1302
ON-OFF MASTER SW.
J1301
BRIDGE, HUNDREDS
BRIDGE, THOUSANDS
BRIDGE, TENS
BRIDGE SUPPLY
BRIDGE, UNITS
CW TUNE R1311 10K
TAKE CONTROL
FSK/VOICE-CW
AUDIO OUTPUT
OFF 60° ON
TAKE CONTROL
FRONT
S1305
REAR
R1309 NOISE CONTROL
15K
R1310A 100K
FRONT SECTION
VOLUME CONTROL
R1310B 5K
REAR SECTION
FSK/VOICE-CW
S1306 HI LO
I1301 X1301
I1302 X1302
I1303 X1303
I1304 X1304
SHARP, CW
BROAD, CW
VOICE
FSK
FRONT
S1304
REAR
CW/B-CW/S SELECTOR
BRILLIANCE CONTROL
FSK VOICE SEL
J1302
HI-LO POWER
START CYCLE SW
REC. SENSITIVITY
27.5V
VOL. CONTROL
CHANNEL SELECTOR R
CHANNEL SELECTOR P
CHANNEL SELECTOR N
CHANNEL SELECTOR M
CHANNEL SELECTOR L

Figure 19-3. Radio Set Control C-451A/ARC-21, Schematic Diagram

WIRE TABLE				
WIRE NO. (INCLUSIVE)	DESCRIPTION			
	COLOR AND CONDUCTOR			
1 - 3	WHT GRN	TR	AWG-24	600V
6 - 8	↑ GRN BLK	↑	↑	↑
10 - 11	│ YEL BLK	│	│	│
15 - 20	│ RED	│	│	│
25 - 28	│ BLK BRN	│	│	│
37 - 42	│ RED BRN	│	│	│
50 - 53	│ YEL RED	│	│	│
60 - 63	│ RED BLU	│	│	│
66 - 68	│ ORN	│	│	│
72 - 73	↓ YEL	│	│	│
80 - 82	WHT BLU BRN	│	│	│
83 - 84	WHT BRN RED	│	│	│
85 - 87	WHT BRN	│	│	│
90 - 91	WHT YEL GRN	↓	↓	↓
95 - 109	WHT BLK	TR	AWG-24	600V
114 - 117	TINNED COPPER WIRE .032 DIA.			
129	SLEEVING		BLK .034 I.D.	
137 - 154	SLEEVING		BLK .085 I.D.	
165 - 168	SLEEVING		BLK 118 I.D.	
180	WHT RED BLK	TR	AWG-24	600V
185	WHT RED GRN	TR	AWG-24	600V
190	WHT BRN GRN	TR	AWG-24	600V

0-S1305-12
11-J1302-S

which sets up the proper circuits for the indicated type of operation. The front of switch S1304 connects the front section of the "VOLUME" control, resistor R1303A, to the receiver to operate as an r-f sensitivity control in the "CW SHARP" and "CW BROAD" positions. In the "VOICE" and "FSK" positions, the front of switch S1304, connects the "NOISE" control, resistor R1302, in the receiver sensitivity circuit.

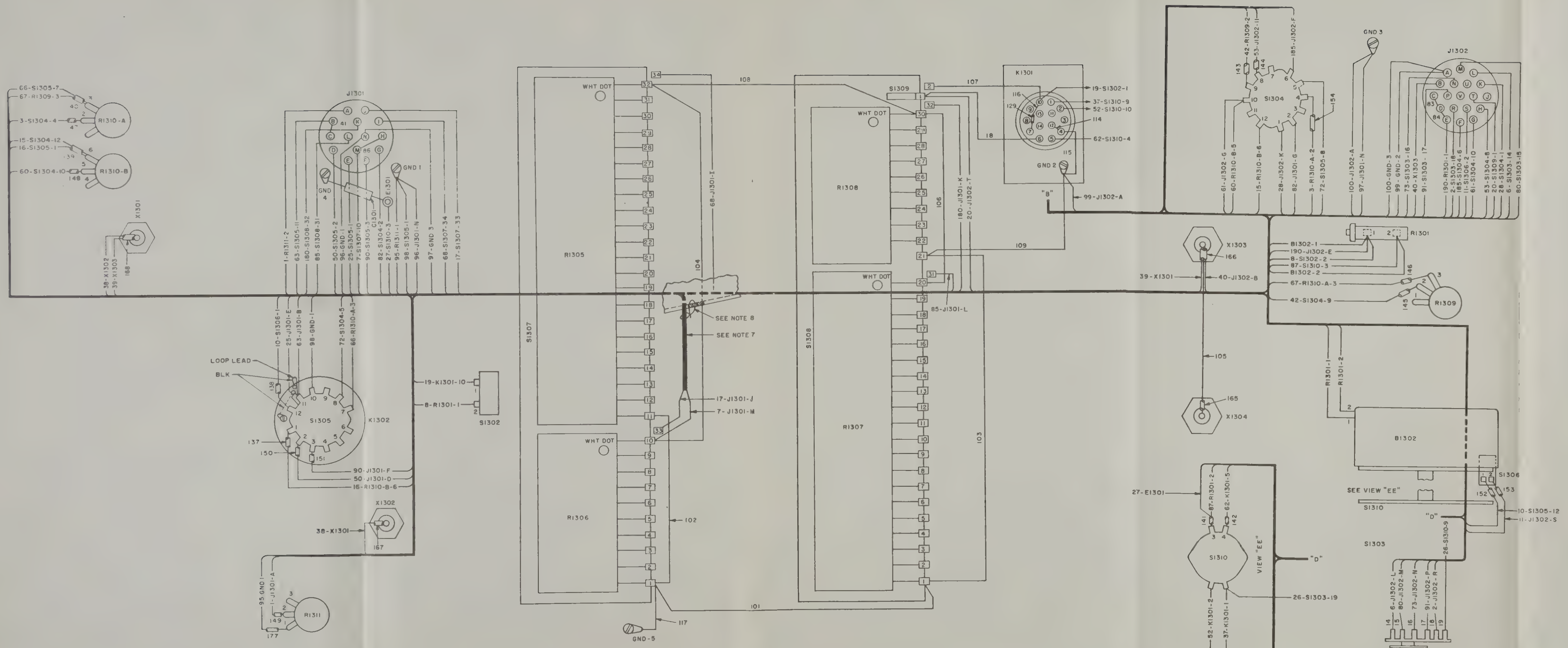
19-17. The rear of switch S1304 shorts out the rear section of the "VOLUME" control, resistor R1303B in the "CW SHARP" and "CW BROAD" positions. Terminal 1 energizes relay K702 in the i-f and audio chassis to provide a high degree of selectivity in the "CW SHARP" position. Terminal 8 energizes the off-on relay in the frequency shift keying adapter when used.

19-18. **"CW TUNE" AND PANEL LIGHTS.** The "CW TUNE" control, resistor R1304, is not switched since it will be effective only during cw operation. The control adjusts the bias on a frequency control tube V711 in the i-f and audio chassis to control the fine tuning for the receiver.

19-19. The panel lamps I1301, I1302, I1303, and I1304 are energized through an external brilliance control not supplied with the equipment.

19-20. MINIMUM PERFORMANCE.

19-21. If repairs have been made perform the operational check (paragraph 19-5) before returning the unit to service.


J1301
R1310-A
R1310-B
X1301
GND 1
GND 4
E1301
C1301
LOOP LEAD
BLK
S1305
K1302
S1302
X1302
R1311
R1305
R1306
S1307
WHT DOT
SEE NOTE 8
SEE NOTE 7
GND-5
R1308
R1307
S1308
S1309
K1301
GND 2
"B"
S1304
GND 3
J1302
X1303
X1304
R1301
R1309
B1302
S1306
SEE VIEW "EE"
S1310
S1303
VIEW "EE"
"D"

WIRE TABLE				
WIRE NO. (INCLUSIVE)	DESCRIPTION			
	COLOR AND CONDUCTOR			
1 - 3	WHT GRN	TR	AWG-24	600V
6 - 8	GRN BLK			
10 - 11	YEL BLK			
15 - 20	RED			
25 - 28	BLK BRN			
37 - 42	RED BRN			
50 - 53	YEL RED			
60 - 63	RED BLU			
66 - 68	ORN			
72 - 73	YEL			
80 - 82	WHT BLU BRN			
83 - 84	WHT BRN RED			
85 - 87	WHT BRN			
90 - 91	WHT YEL GRN			
95 - 109	WHT BLK	TR	AWG-24	600V
114 - 117	TINNED COPPER WIRE .032 DIA.			
129	SLEEVING		BLK .034 I.D.	
137 - 154	SLEEVING		BLK .085 I.D.	
165 - 168	SLEEVING		BLK 118 I.D.	
180	WHT RED BLK TR		AWG-24	600V
185	WHT RED GRN TR		AWG-24	600V
190	WHT BRN GRN TR		AWG-24	600V

Figure 19-4. Radio Set Control C-451A/ARC-21, Connection Diagram

which sets up the proper circuits for the indicated type of operation. The front of switch S1304 connects the front section of the "VOLUME" control, resistor R1303A, to the receiver to operate as an r-f sensitivity control in the "CW SHARP" and "CW BROAD" positions. In the "VOICE" and "FSK" positions, the front of switch S1304, connects the "NOISE" control, resistor R1302, in the receiver sensitivity circuit.

19-17. The rear of switch S1304 shorts out the rear section of the "VOLUME" control, resistor R1303B in the "CW SHARP" and "CW BROAD" positions. Terminal 1 energizes relay K702 in the i-f and audio chassis to provide a high degree of selectivity in the "CW SHARP" position. Terminal 8 energizes the off-on relay in the frequency shift keying adapter when used.

19-18. "CW TUNE" AND PANEL LIGHTS. The "CW TUNE" control, resistor R1304, is not switched since it will be effective only during cw operation. The control adjusts the bias on a frequency control tube V711 in the i-f and audio chassis to control the fine tuning for the receiver.

19-19. The panel lamps I1301, I1302, I1303, and I1304 are energized through an external brilliance control not supplied with the equipment.

19-20. MINIMUM PERFORMANCE.

19-21. If repairs have been made perform the operational check (paragraph 19-5) before returning the unit to service.

SECTION XX

MAINTENANCE INSTRUCTIONS FOR DYNAMOTOR ASSEMBLY DY-50/ARC-21

20-1. GENERAL.

20-2. This unit is used as a power supply for the AN/ARC-21 equipment when available power is a nominal 28 volts direct current. It employs three dynamotors, one of which, D1601, operates continuously to provide +140 volts for receiver operation, the others, D1602 and D1603, are 440- and 640-volt machines operating during transmission periods.

20-3. TROUBLE ANALYSIS.

20-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

20-5. A defective chassis should first be examined for broken or loose parts and then connected into the test setup for system analysis as given in table XCIII.

WARNING

> Voltages in this unit may prove fatal on contact. Do not replace parts or make repairs with power on.

20-6. The relay, resistor and filter components listed as the possible cause of defects can be checked by using a Multimeter TS-352/U. Refer to the schematic diagram, figure 20-3, for d-c values for these components. Defective dynamotors should be replaced as

TABLE XCIII. TROUBLE ANALYSIS, DYNAMOTOR ASSEMBLY DY-50/ARC-21

Circuit Breakdown, Schematic Diagram, Figure 20-3

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	10 (J1601)	Connect Multimeter ME-75/ARC-21. Selector switch at position 3.	Radio Set Control C-451A/ARC-21 set for "VOICE" operation "POWER" at "HI," "CONTROL" at "ON" Press microphone button	1040V (transmit)	K1602 K1601 Z1602 D1602 D1603 Z1603 C1616
2	10 (J1601)	Selector switch at position 7	Same as step 1	-20V (receive)	R1601 R1602 R1607 R1608 R1609 C1614 D1601
3	11 (J1602)	Same as step 1 Selector switch at position 3	Same as step 1 Press microphone button	400V (transmit)	K1601 Z1602 D1602 Z1603
4	11 (J1602)	Same as step 1 Selector switch at position 4	Same as step 1	140V	Z1601 D1601 R1601
5	11 (J1602)	Same as step 1 Selector switch at position 6	Same as step 1	27.5V	K1602 d-c supply
6	11 (J1602)	Same as step 1 Selector switch at position 7	Same as step 1 Press microphone button	-18V (transmit)	R1604 R1605 R1606 THY1601 THY1602 K1603 D1602

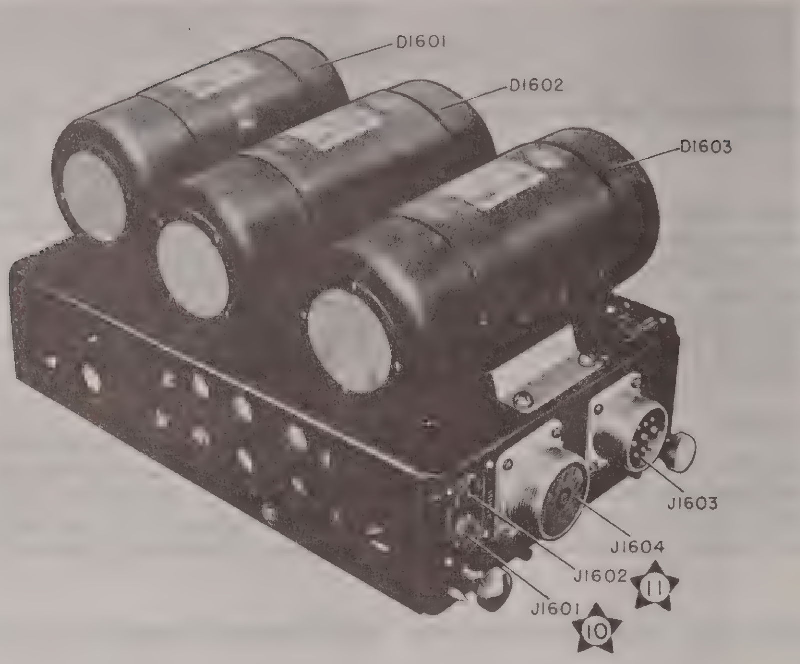

D1601
D1602
D1603
J1603
J1604
J1602
11
J1601
10

Figure 20-1. Dynamotor Assembly DY-50/ARC-21, Top

complete units and defective units forwarded to depot for overhaul.

20-7. CIRCUIT ANALYSIS. (See figure 20-3.)

20-8. The equipment is turned on by the starting relay K1602 through the "take control" circuits. This relay starts the receiver (140 volts) dynamotor D1601 and connects 27.5-volt d-c to the blower, ratchet motor, heater and relay circuits. Receiver circuit bias is developed across resistor R1601, in the dynamotor negative lead, and filtered by resistor R1602 and capacitor C1614.

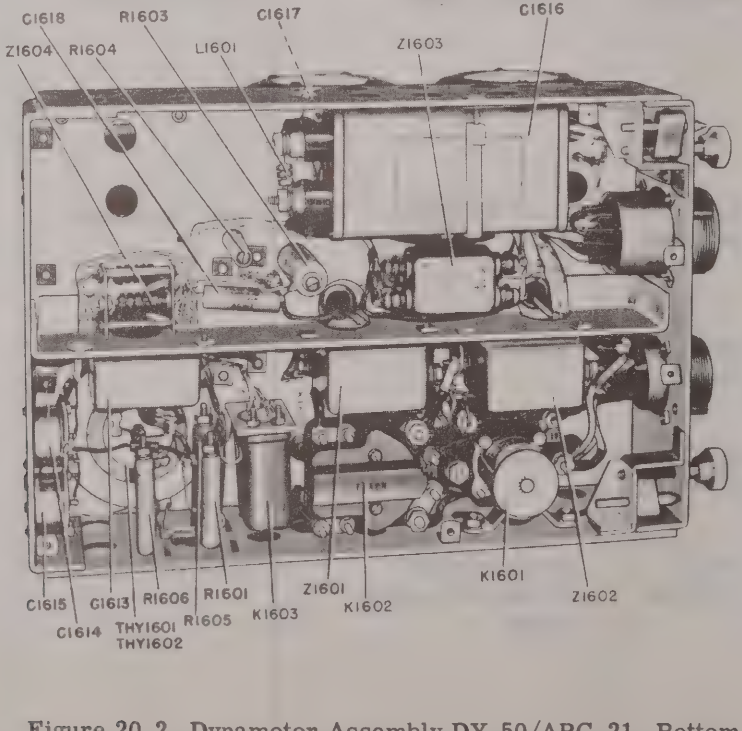
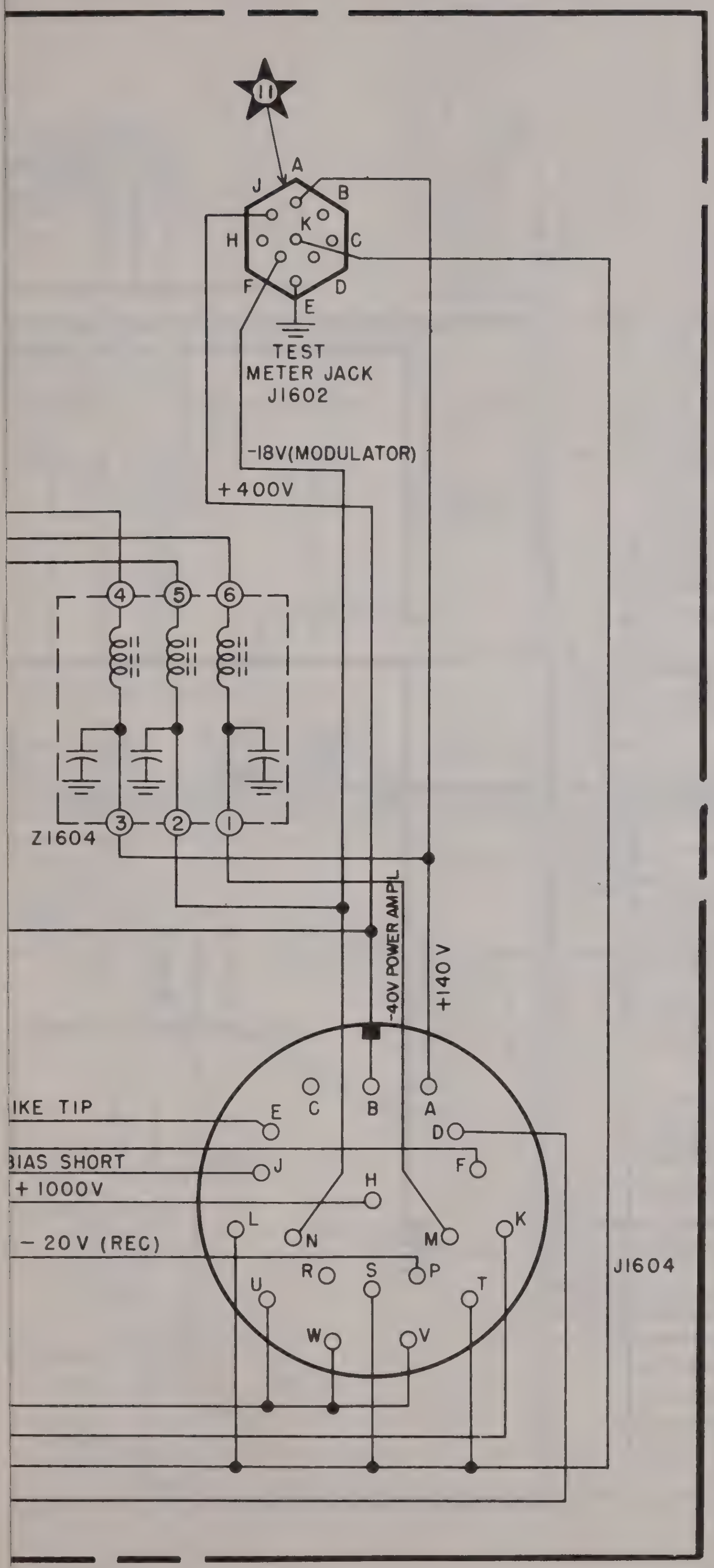

C1618
R1603
C1617
C1616
Z1604
R1604
L1601
Z1603
C1615
C1614
C1613
THY1601
THY1602
R1606
R1605
R1601
K1603
Z1601
K1602
K1601
Z1602

Figure 20-2. Dynamotor Assembly DY-50/ARC-21, Bottom


11
A
B
C
D
E
F
H
J
K
TEST
METER JACK
J1602
-18V(MODULATOR)
+400V
4
5
6
3
2
1
Z1604
-40V POWER AMPL
+140V
IKE TIP
BIAS SHORT
+1000V
- 20V (REC)
A
B
C
D
E
F
H
J
K
L
M
N
P
R
S
T
U
V
W
J1604

NOTE 1:
ALL CAPACITOR VALUES
ARE IN MICROFARADS

Figure 20-3. Dynamotor Assembly DY-50/ARC-21, Schematic Diagram

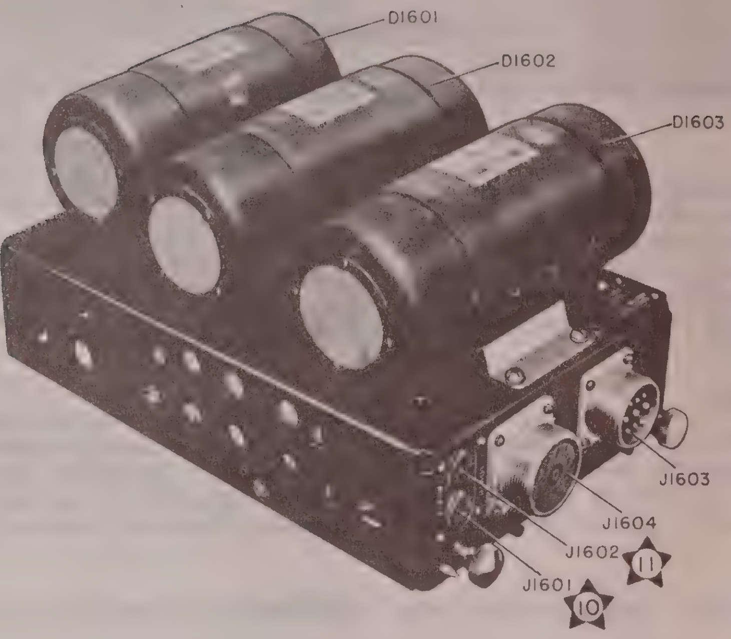

D1601
D1602
D1603
J1603
J1604
J1602
11
J1601
10

Figure 20-1. Dynamotor Assembly DY-50/ARC-21, Top

complete units and defective units forwarded to depot for overhaul.

20-7. CIRCUIT ANALYSIS. (See figure 20-3.)

20-8. The equipment is turned on by the starting relay K1602 through the "take control" circuits. This relay starts the receiver (140 volts) dynamotor D1601 and connects 27.5-volt d-c to the blower, ratchet motor, heater and relay circuits. Receiver circuit bias is developed across resistor R1601, in the dynamotor negative lead, and filtered by resistor R1602 and capacitor C1614.

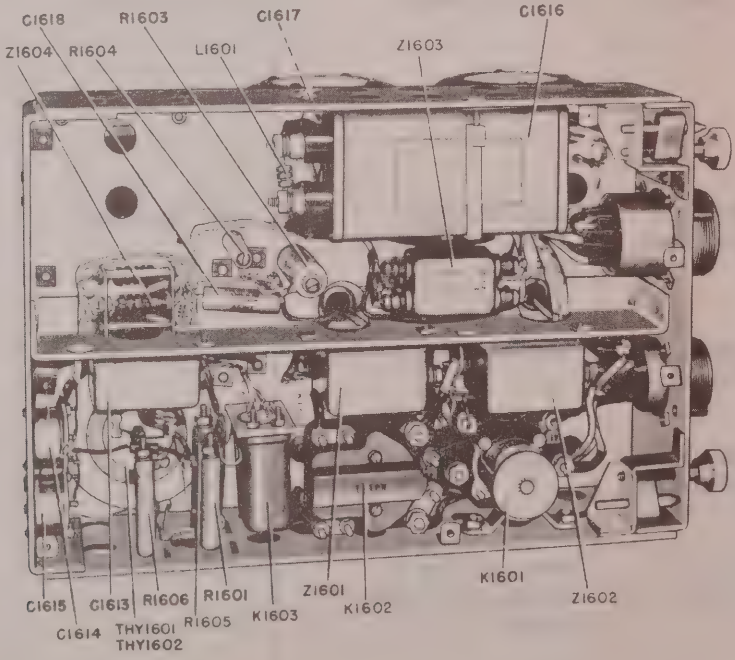
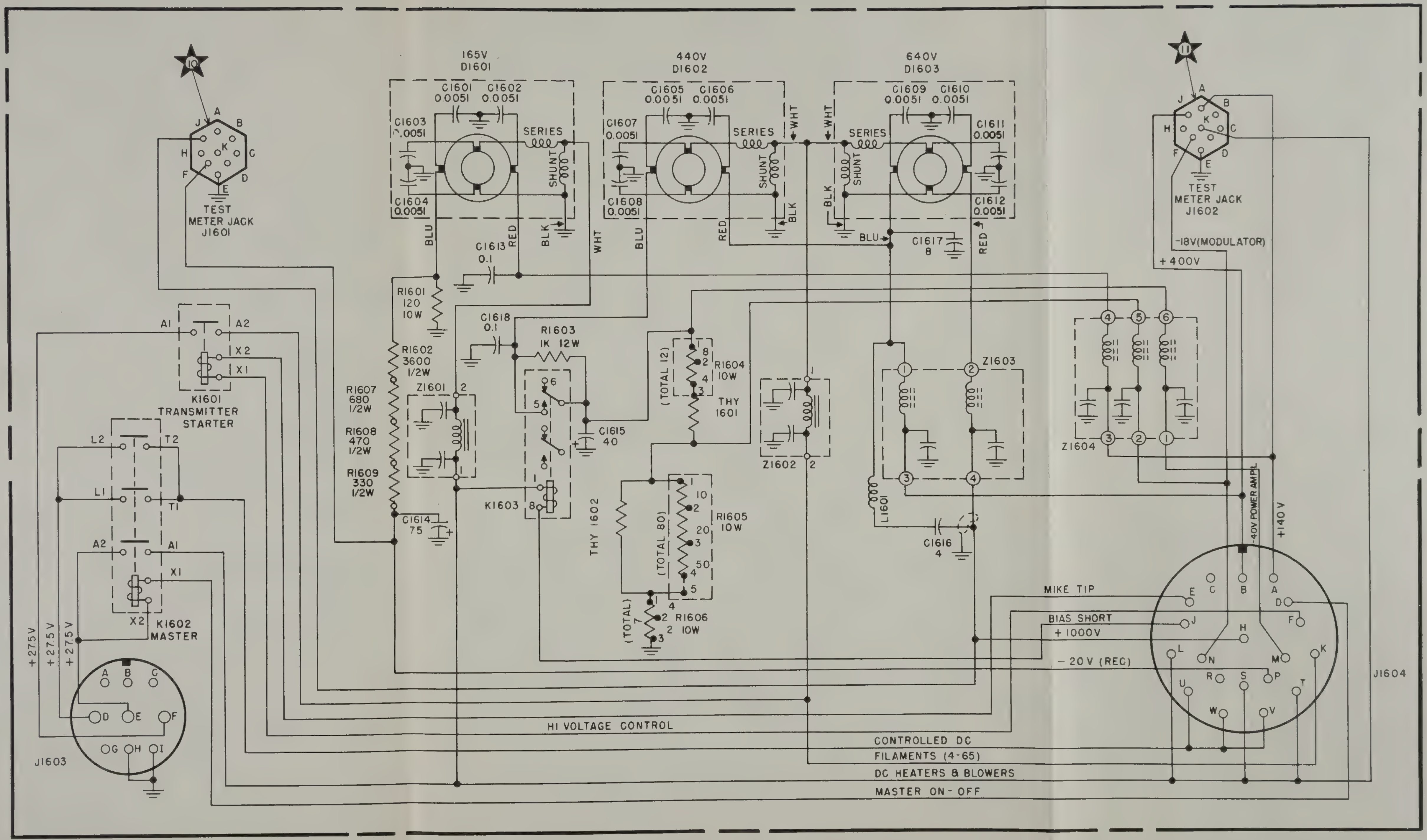

C1618
R1603
C1617
C1616
Z1604
R1604
L1601
Z1603
C1615
C1614
C1613
THY1601
THY1602
R1606
R1605
R1601
K1603
Z1601
K1602
K1601
Z1602

Figure 20-2. Dynamotor Assembly DY-50/ARC-21, Bottom


10
J A B C D E F H K
TEST METER JACK J1601
165V D1601
C1601 0.0051
C1602 0.0051
C1603 .0051
C1604 0.0051
SERIES
SHUNT
BLU RED BLK WHT
440V D1602
C1605 0.0051
C1606 0.0051
C1607 0.0051
C1608 0.0051
640V D1603
C1609 0.0051
C1610 0.0051
C1611 0.0051
C1612 0.0051
C1613 0.1
C1617 8
11
TEST METER JACK J1602
-18V (MODULATOR)
+400V
R1601 120 10W
R1602 3600 1/2W
R1607 680 1/2W
R1608 470 1/2W
R1609 330 1/2W
C1614 75
C1618 0.1
R1603 1K 12W
C1615 40
Z1601
K1603
R1604 10W
(TOTAL 12)
THY 1601
THY 1602
R1605 10W
(TOTAL 80)
R1606 10W
(TOTAL) 7
Z1602
Z1603
Z1604
L1601
C1616 4
A1 A2 X2 X1
K1601 TRANSMITTER STARTER
L2 T2 L1 T1
K1602 MASTER
+27.5V
+27.5V
+27.5V
J1603
A B C D E F G H I
MIKE TIP
BIAS SHORT
+1000V
-20V (REC)
-40V POWER AMPL
+140V
J1604
HI VOLTAGE CONTROL
CONTROLLED DC
FILAMENTS (4-65)
DC HEATERS & BLOWERS
MASTER ON-OFF

NOTE 1:
ALL CAPACITOR VALUES ARE IN MICROFARADS

Figure 20-3. Dynamotor Assembly DY-50/ARC-21, Schematic Diagram

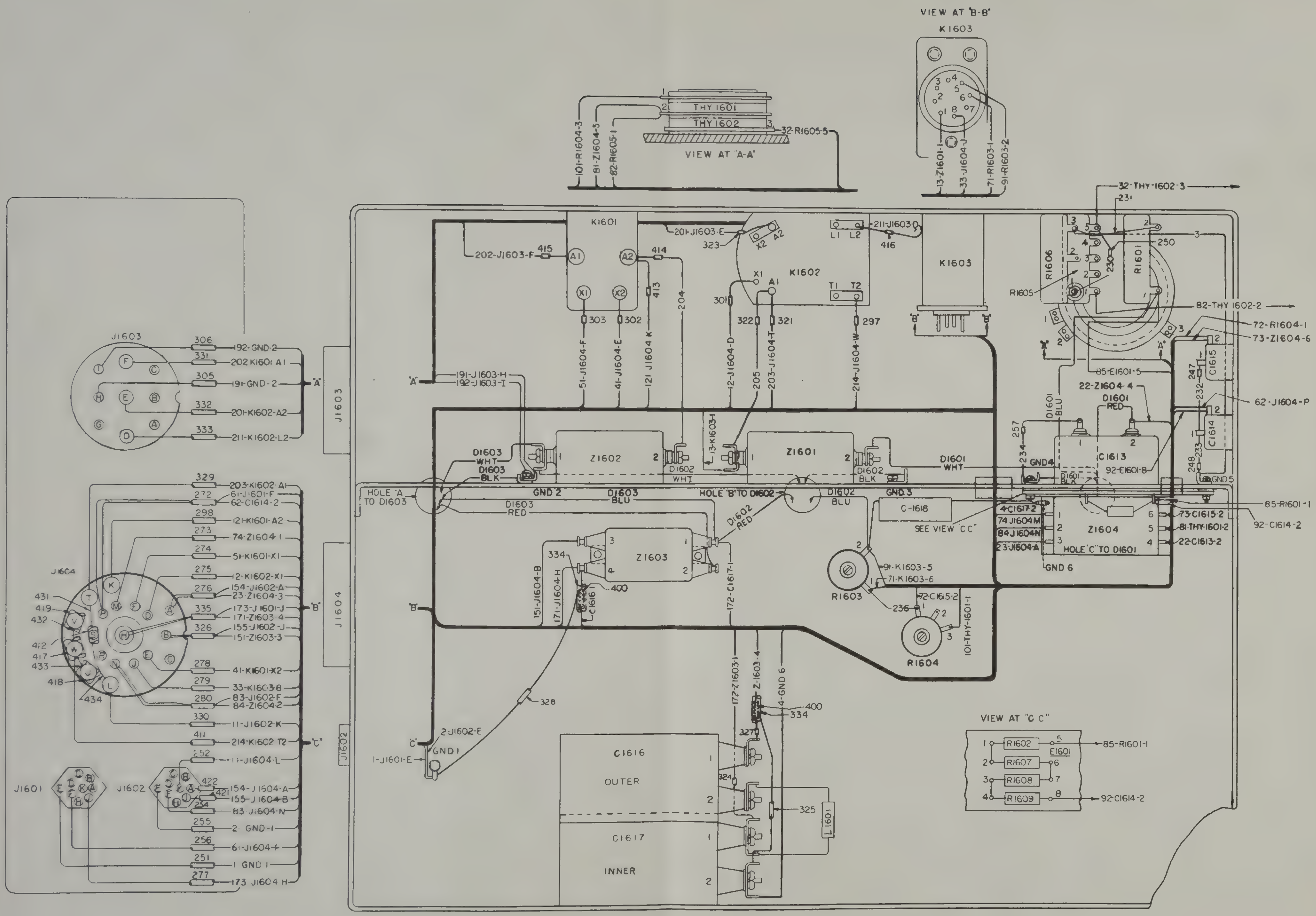
WIRE		
DESCRIPTION		
COLOR AND CONDUCTOR		
T-BLKTR.	AWG 24	600V
BRNTR.		
RED TR.		
YEL TR.		
BLK/BRNTR.		
BLK/RED TR.		
YEL/BLK TR.		
YEL/RED TR.		
T YEL/GRN TR.		
	AWG 24	
T BRN TR.	AWG 18	
RED TR.	AWG 20	
ORN TR.	AWG 20	600V
RED TR.		
BLK TR.	AWG 14	1000V
BRN TR.	AWG14	1000V
T-YEL TR.	AWG14	1000V
E TINNED COPPER .032 DIA		
EVING SIL.RUBBER BLK .034 ID		
EVING SIL.RUBBER BLK .053 ID		
EVING SIL.RUBBER BLK .085 ID		
EVING SIL.RUBBER BLK .095 ID		
EVING SIL.RUBBER BLK .118 ID		
EVING SIL.RUBBER BLK .148 ID		
EVING SIL.RUBBER BLK .208 ID		
LE		
EVING SIL.RUBBER BLK .148 ID		

20-9. The input lead to dynamotor D1601 is filtered by filter Z1601. The output is filtered by capacitor C1613 and one of the three filters in filter assembly Z1604. In addition capacitors C1601, C1602, C1603, and C1604, in the dynamotor assembly, prevent commutator interference from being radiated by the commutator leads.

20-10. Relay K1601 is energized when any of the transmission switches are closed. This starts dynamotors D1602 and D1603 and applies heater power to the power amplifier and modulator tubes. The dynamotors are 400- and 600-volt machines, connected in series to supply 400 and 1000 volts for exciter, modulator, and power amplifier. In addition two bias voltages of -18 and -40 volts are developed in the circuits of resistors THY1602, THY1601, and R1606. Resistor R1605 is tapped to provide adjustment of the bias voltages.

20-11. Filter Z1602 prevents commutator interference from either the 400- or 600-volt dynamotor input being radiated by the wiring. Likewise filter Z1603, with capacitors C1616 and C1617, filters the 400- and 1000-volt supply circuits. The bias circuits are filtered by the multiple filter, Z1604.

20-12. Two test meter jacks, J1601 and J1602, permit checking the output voltages without removing the power supply from its operating position. Relay K1603 is energized whenever transmission takes place, shorting out resistor R1603. During the four-second period following a transmission, this relay opens to reduce the plate and screen voltages on the power amplifier tubes.


VIEW AT "B-B"
K1603
THY 1601
THY 1602
VIEW AT "A-A"
32-R1605-5
101-R1604-3
81-Z1604-5
82-R1605-1
13-Z1601-1
33-J1604-J
71-R1603-1
91-R1603-2
32-THY-1602-3
K1601
K1602
K1603
R1606
R1601
R1605
82-THY 1602-2
72-R1604-1
73-Z1604-6
C1615
C1614
62-J1604-P
85-E1601-5
22-Z1604-4
D1601 RED
D1601 BLU
C1613
92-E1601-8
GND 4
GND 5
85-R1601-1
92-C1614-2
73-C1615-2
81-THY-1601-2
22-C1613-2
Z1604
HOLE "C" TO D1601
GND 6
C-1618
SEE VIEW "CC"
4-C1617-2
74-J1604M
84-J1604N
23-J1604-A
J1603
J1604
J1602
J1601
Z1602
Z1601
Z1603
D1603 WHT
D1603 BLK
D1602 WHT
D1602 BLK
D1601 WHT
HOLE "A" TO D1603
GND 2
D1603 BLU
D1603 RED
HOLE "B" TO D1602
D1602 BLU
D1602 RED
GND 3
R1603
R1604
91-K1603-5
71-K1603-6
72-C1615-2
101-THY-1601-1
202-J1603-F
201-J1603-E
211-J1603-D
192-GND-2
202-K1601 A1
191-GND-2
201-K1602-A2
211-K1602-L2
203-K1602-A1
61-J1601-F
62-C1614-2
121-K1601-A2
74-Z1604-1
51-K1601-X1
12-K1602-X1
154-J1602-A
23-Z1604-3
173-J1601-J
171-Z1603-4
155-J1602-J
151-Z1603-3
41-K1601-X2
33-K1603-B
83-J1602-F
84-Z1604-2
11-J1602-K
214-K1602 T2
11-J1604-L
154-J1604-A
155-J1604-B
83-J1604-N
2-GND-1
61-J1604-F
1 GND 1
173 J1604 H
"A"
"B"
"C"
2-J1602-E
1-J1601-E
GND 1
C1616
OUTER
C1617
INNER
L1601
VIEW AT "C C"
R1602
R1607
R1608
R1609
E1601
85-R1601-1
92-C1614-2

WIRE NOS INCLUSIVE	WIRE DESCRIPTION COLOR AND CONDUCTOR
1-4	WHT-BLK TR. AWG 24 600V
11-13	BRN TR
22-23	RED TR.
32-33	YEL TR
41	BLK/BRN TR.
51	BLK/RED TR.
61-62	YEL/BLK TR.
71-74	YEL/RED TR.
81-85	WHT YEL/GRN TR.
91-92	YEL
101	GRN AWG 24
121	WHT BRN TR. AWG 18
431-434	RED TR. AWG 20
151-155	ORN TR. AWG 20 600V
171-173	RED TR.
191-192	BLK TR. AWG 14 1000V
201-205	BRN TR. AWG 14 1000V
211-214	WHT-YEL TR. AWG 14 1000V
230-236	WIRE TINNED COPPER .032 DIA
247-250	SLEEVING SIL. RUBBER BLK .034 ID
251-257	SLEEVING SIL. RUBBER BLK .053 ID
421-422	SLEEVING SIL RUBBER BLK .085 ID
272-280	SLEEVING SIL RUBBER BLK .095 ID
297-306	SLEEVING SIL. RUBBER BLK .118 ID
321-330	SLEEVING SIL RUBBER BLK .148 ID
331-335	SLEEVING SIL. RUBBER BLK .208 ID
400	CABLE
411-419	SLEEVING SIL. RUBBER BLK .148 ID

Figure 20-4. Dynamotor Assembly DY-50/ARC-21, Connection Diagram

20-9. The input lead to dynamotor D1601 is filtered by filter Z1601. The output is filtered by capacitor C1613 and one of the three filters in filter assembly Z1604. In addition capacitors C1601, C1602, C1603, and C1604, in the dynamotor assembly, prevent commutator interference from being radiated by the commutator leads.

20-10. Relay K1601 is energized when any of the transmission switches are closed. This starts dynamotors D1602 and D1603 and applies heater power to the power amplifier and modulator tubes. The dynamotors are 400- and 600-volt machines, connected in series to supply 400 and 1000 volts for exciter, modulator, and power amplifier. In addition two bias voltages of -18 and -40 volts are developed in the circuits of resistors THY1602, THY1601, and R1606. Resistor R1605 is tapped to provide adjustment of the bias voltages.

20-11. Filter Z1602 prevents commutator interference from either the 400- or 600-volt dynamotor input being radiated by the wiring. Likewise filter Z1603, with capacitors C1616 and C1617, filters the 400- and 1000-volt supply circuits. The bias circuits are filtered by the multiple filter, Z1604.

20-12. Two test meter jacks, J1601 and J1602, permit checking the output voltages without removing the power supply from its operating position. Relay K1603 is energized whenever transmission takes place, shorting out resistor R1603. During the four-second period following a transmission, this relay opens to reduce the plate and screen voltages on the power amplifier tubes.

SECTION XXI

MAINTENANCE INSTRUCTIONS FOR POWER SUPPLY PP-298/ARC-21X

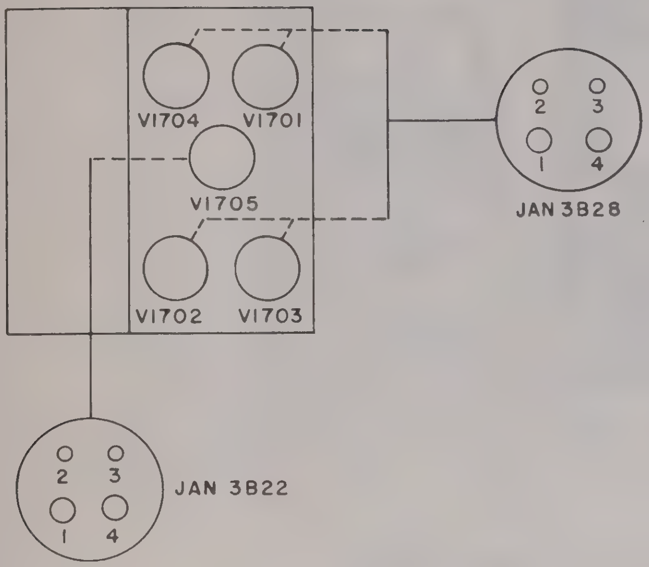

V1704
V1701
V1705
V1702
V1703
2
3
1
4
JAN 3B28
2
3
1
4
JAN 3B22

Figure 21-1. Power Supply PP-298/ARC-21X, Tube Location

21-1. GENERAL.

21-2. This power supply is employed where 115-volt ac, 380 to 1000 cps single phase, is available in addition to the nominal 28-volt d-c source. The unit develops the high d-c voltage by means of two transformer-tube rectifier arrangements.

21-3. TROUBLE ANALYSIS.

21-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

WARNING

Voltages used in this unit may prove fatal on contact. Do not replace tubes or make repairs with power on.

21-5. A defective chassis should first be examined for missing or broken parts and tubes or seepage from potted components. Then connect the unit into the

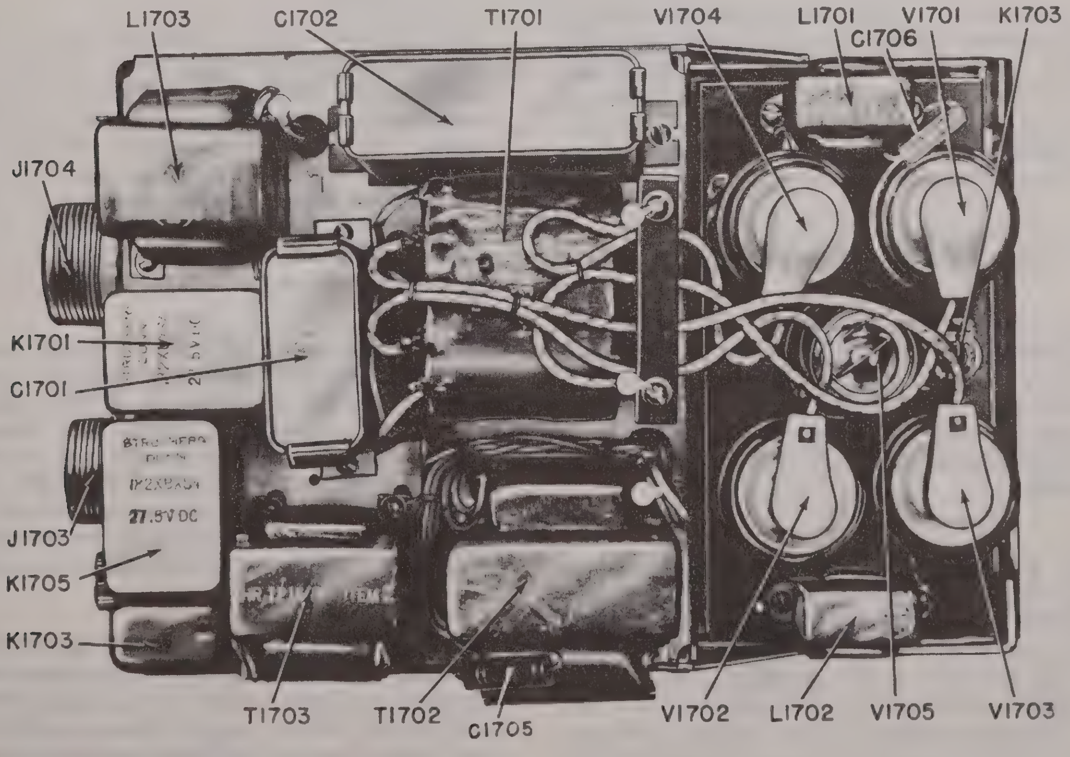

L1703
C1702
T1701
V1704
L1701
V1701
K1703
C1706
J1704
K1701
C1701
J1703
K1705
K1703
27.5V DC
T1703
T1702
C1705
V1702
L1702
V1705
V1703

Figure 21-2. Power Supply PP-298/ARC-21X, Top

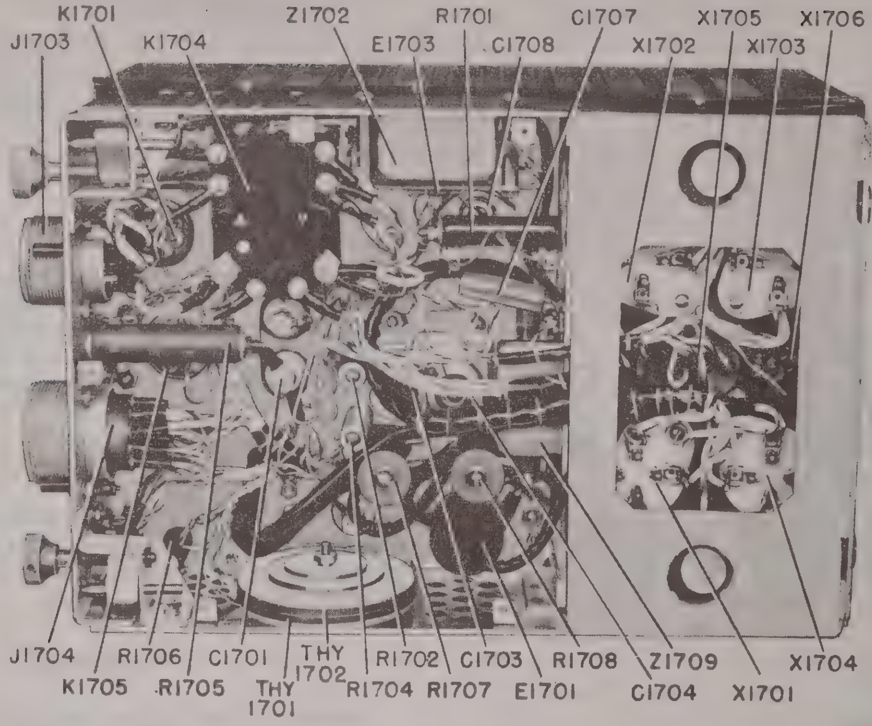


Figure 21-3. Power Supply PP-298/ARC-21X, Bottom

systems test setup and perform the procedure given in table XCIV. See figure 21-1 for tube locations.

21-6. All components, except tubes, listed as possible cause of abnormal indications can be checked with a Multimeter TS-352/U. Resistance values for coil windings and other components are given on the schematic diagram, figure 21-4. When tubes are suspected, replace with tubes known to be good and repeat steps where tubes are involved.

21-7. CIRCUIT ANALYSIS. (See figure 21-3.)

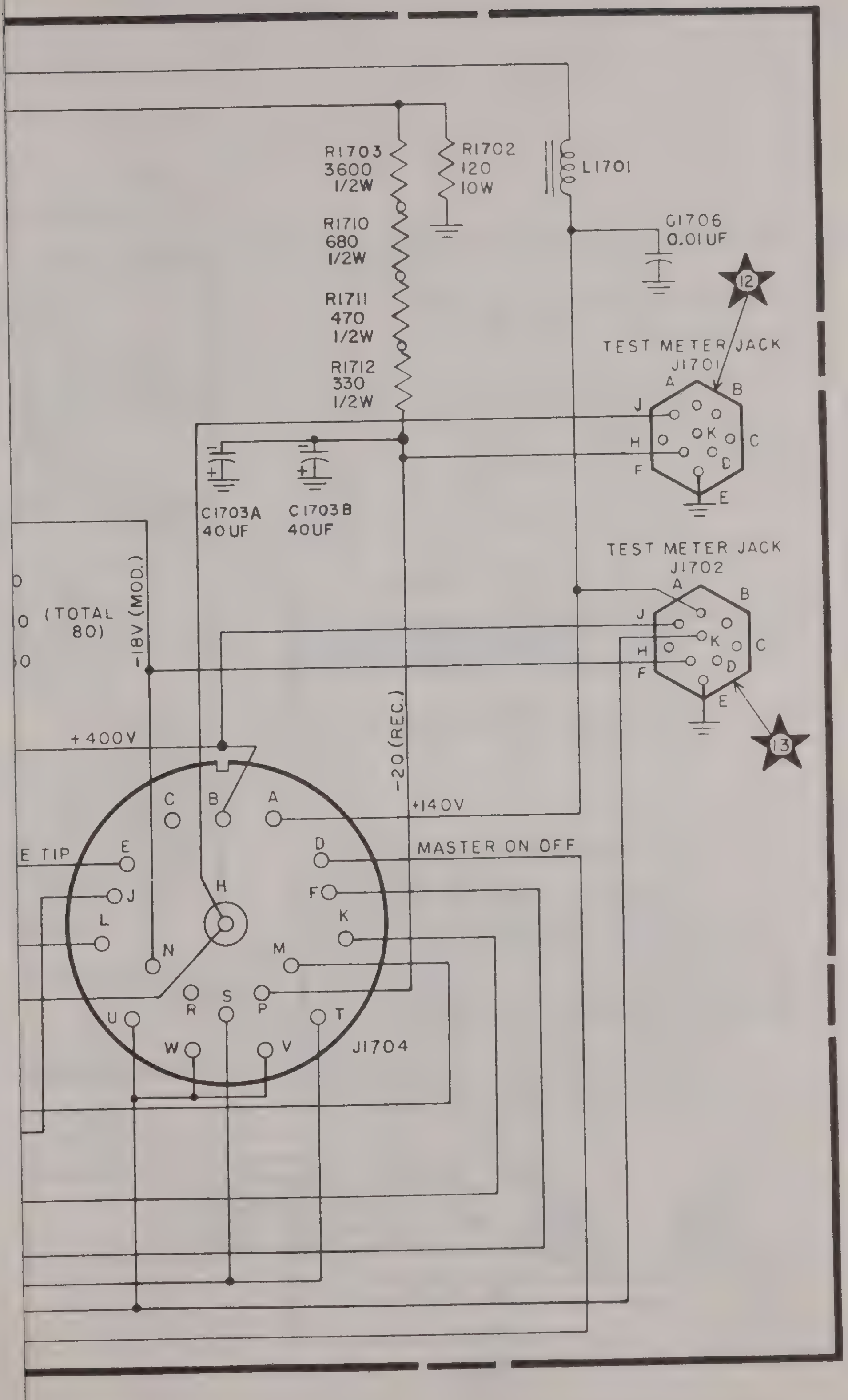
21-8. This unit supplies the same voltages as the Dynamotor Assembly DY-50/ARC-21 but uses vacuum tube rectifiers, supplied by transformers, for all voltages other than the 27.5 volts d-c. Input voltages of 27.5 volts d-c and 115 volts, 380- to 1000-cycle a-c, are applied through jack J1703. Jack J1703 is the output jack.

21-9. Relay K1704 switches the power supply on and off. Relay K1705 is the transmission-on relay, energizing the 400- and 1000-volt rectifier tubes V702, V703, V701, and V704. Relay K1703 shorts the voltage dropping resistor R1701 during actual transmission. When resistor R1701 is in the circuit it reduces the voltage applied to the screen grids and plates of the power amplifier tubes. Relay K1701, controlled by the thermal time-delay relay, K1702, prevents application of the plate voltage to the rectifiers before their heaters are at operating temperatures.

21-10. Filter Z1701, in the primary circuit of the high-voltage transformer T1701, and filter Z1702, in the primary circuit of the filament transformer T1702 and the low-voltage plate transformer T1703, prevent passage of radio interference. The 400-volt supply is filtered by choke L1702 and capacitor C1701. The 1000-volt supply is filtered by choke L1703 and capacitor C1702, and the 140-volt supply is filtered by choke L1701 and a capacitor C1201 in the Chassis, Receiver-Transmitter MX1424A/ARC-21.

21-11. Resistor R1702 is the dropping resistor across which the receiver bias is developed. The bias voltage is filtered by resistors R1703, R1710, R1711, and R1712 and capacitor C1703. The transmitter bias voltages of -18 and -40 volts are derived through resistors R1704, THY1702, THY1701, R1705, and R1706. These resistors are tapped to permit adjustment of either bias voltage for the particular installation. Capacitor C1704 filters the bias circuits.

21-12. At high altitude, spark gap E1701 prevents external flashovers in the high voltage rectifier circuits caused by transients between high potential points and ground. All the output voltages can be read on the test meter from jacks J1701 and J1702. All the tubes are of the Xenon gas-filled type.


R1703
3600
1/2W
R1702
120
10W
L1701
R1710
680
1/2W
C1706
0.01UF
R1711
470
1/2W
12
TEST METER JACK
J1701
R1712
330
1/2W
A
B
J
K
C
H
D
F
E
C1703A
40UF
C1703B
40UF
TEST METER JACK
J1702
A
B
J
K
C
H
D
F
E
(TOTAL
80)
-18V (MOD.)
-20 (REC.)
13
+400V
+140V
MASTER ON OFF
E TIP
C
B
A
D
E
J
F
H
K
L
N
M
R
S
P
U
T
W
V
J1704

Power Supply PP-298/ARC-21X, Schematic Diagram

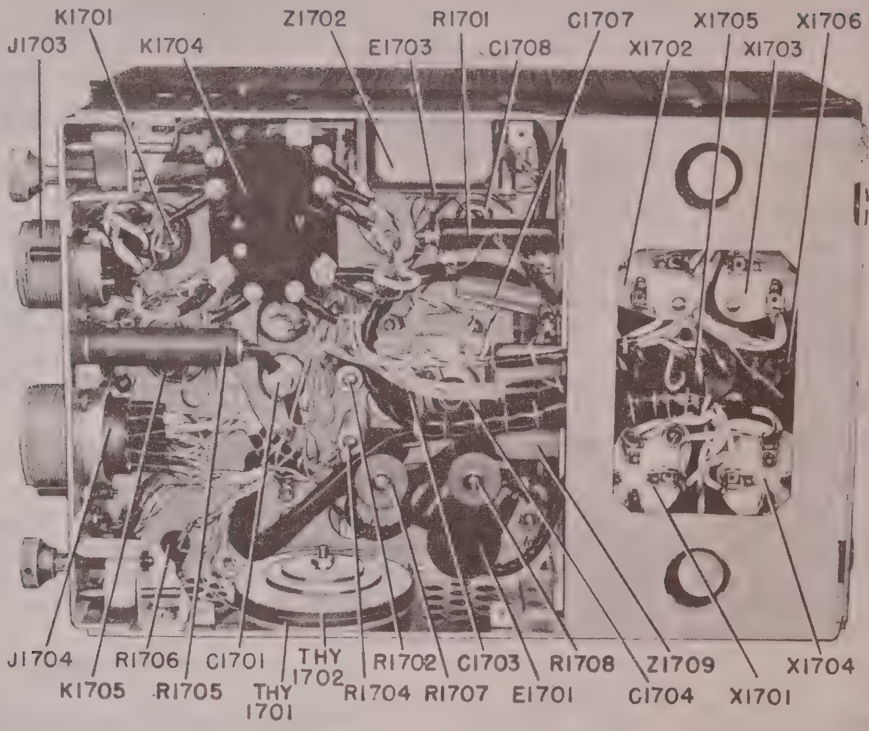


Figure 21-3. Power Supply PP-298/ARC-21X, Bottom

systems test setup and perform the procedure given in table XCIV. See figure 21-1 for tube locations.

21-6. All components, except tubes, listed as possible cause of abnormal indications can be checked with a Multimeter TS-352/U. Resistance values for coil windings and other components are given on the schematic diagram, figure 21-4. When tubes are suspected, replace with tubes known to be good and repeat steps where tubes are involved.

21-7. CIRCUIT ANALYSIS. (See figure 21-3.)

21-8. This unit supplies the same voltages as the Dynamotor Assembly DY-50/ARC-21 but uses vacuum tube rectifiers, supplied by transformers, for all voltages other than the 27.5 volts d-c. Input voltages of 27.5 volts d-c and 115 volts, 380- to 1000-cycle a-c, are applied through jack J1703. Jack J1703 is the output jack.

21-9. Relay K1704 switches the power supply on and off. Relay K1705 is the transmission-on relay, energizing the 400- and 1000-volt rectifier tubes V702, V703, V701, and V704. Relay K1703 shorts the voltage dropping resistor R1701 during actual transmission. When resistor R1701 is in the circuit it reduces the voltage applied to the screen grids and plates of the power amplifier tubes. Relay K1701, controlled by the thermal time-delay relay, K1702, prevents application of the plate voltage to the rectifiers before their heaters are at operating temperatures.

21-10. Filter Z1701, in the primary circuit of the high-voltage transformer T1701, and filter Z1702, in the primary circuit of the filament transformer T1702 and the low-voltage plate transformer T1703, prevent passage of radio interference. The 400-volt supply is filtered by choke L1702 and capacitor C1701. The 1000-volt supply is filtered by choke L1703 and capacitor C1702, and the 140-volt supply is filtered by choke L1701 and a capacitor C1201 in the Chassis, Receiver-Transmitter MX1424A/ARC-21.

21-11. Resistor R1702 is the dropping resistor across which the receiver bias is developed. The bias voltage is filtered by resistors R1703, R1710, R1711, and R1712 and capacitor C1703. The transmitter bias voltages of -18 and -40 volts are derived through resistors R1704, THY1702, THY1701, R1705, and R1706. These resistors are tapped to permit adjustment of either bias voltage for the particular installation. Capacitor C1704 filters the bias circuits.

21-12. At high altitude, spark gap E1701 prevents external flashovers in the high voltage rectifier circuits caused by transients between high potential points and ground. All the output voltages can be read on the test meter from jacks J1701 and J1702. All the tubes are of the Xenon gas-filled type.

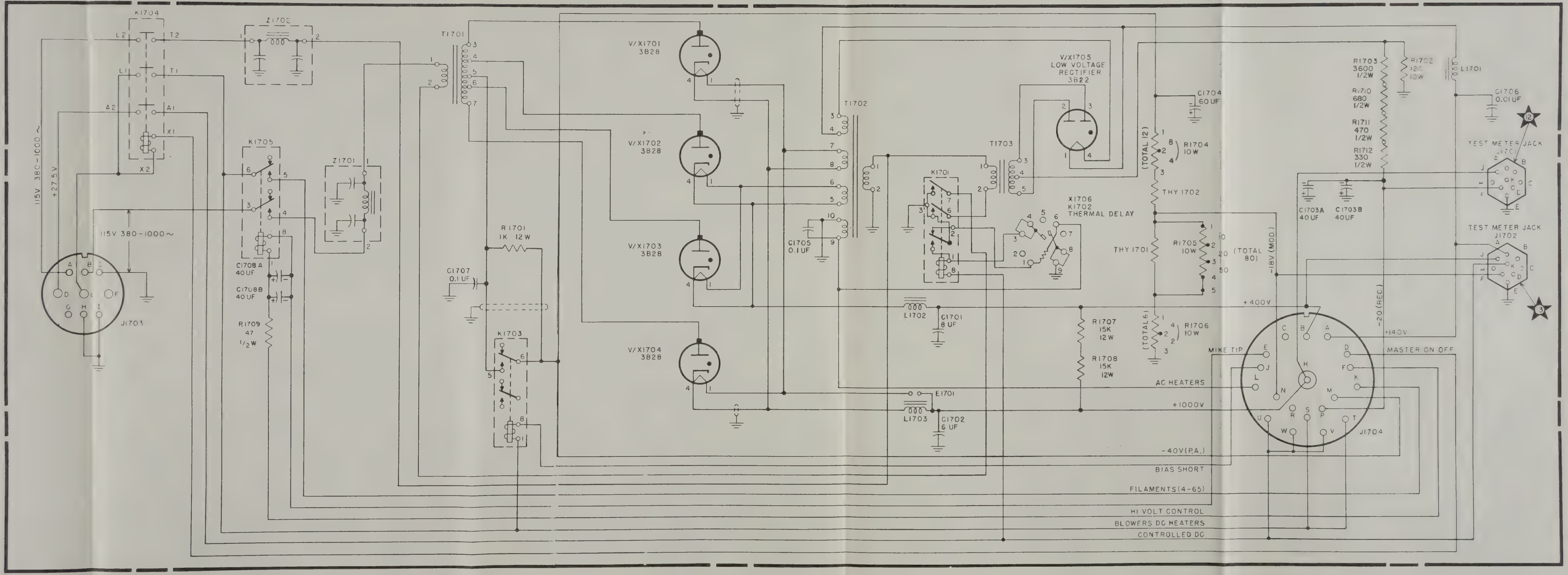

K1704
L2
T2
L1
T1
A2
A1
X1
X2
Z1702
1
2
T1701
3
4
5
6
7
V/X1701
3B28
V/X1702
3B28
V/X1703
3B28
V/X1704
3B28
115V 380-1000~
+27.5V
115V 380-1000~
K1705
6
5
3
4
8
Z1701
C1708A
40UF
C1708B
40UF
R1709
47
1/2W
J1703
A
B
C
D
E
F
G
H
I
R1701
1K 12W
C1707
0.1UF
K1703
T1702
10
9
C1705
0.1UF
L1702
C1701
8 UF
E1701
L1703
C1702
6 UF
K1701
T1703
V/X1705
LOW VOLTAGE
RECTIFIER
3B22
C1704
60 UF
X1706
K1702
THERMAL DELAY
(TOTAL 12)
R1704
10W
THY 1702
THY 1701
R1705
10W
(TOTAL 80)
(TOTAL 6)
R1706
10W
R1707
15K
12W
R1708
15K
12W
-18V (MOD.)
-20 (REC.)
+400V
+140V
MIKE TIP
AC HEATERS
+1000V
-40V(P.A.)
BIAS SHORT
FILAMENTS(4-65)
HI VOLT CONTROL
BLOWERS DC HEATERS
CONTROLLED DC
MASTER ON OFF
J1704
R1703
3600
1/2W
R1710
680
1/2W
R1711
470
1/2W
R1712
330
1/2W
R1702
120
10W
L1701
C1706
0.01UF
C1703A
40UF
C1703B
40UF
TEST METER JACK
J1701
TEST METER JACK
J1702
12
3

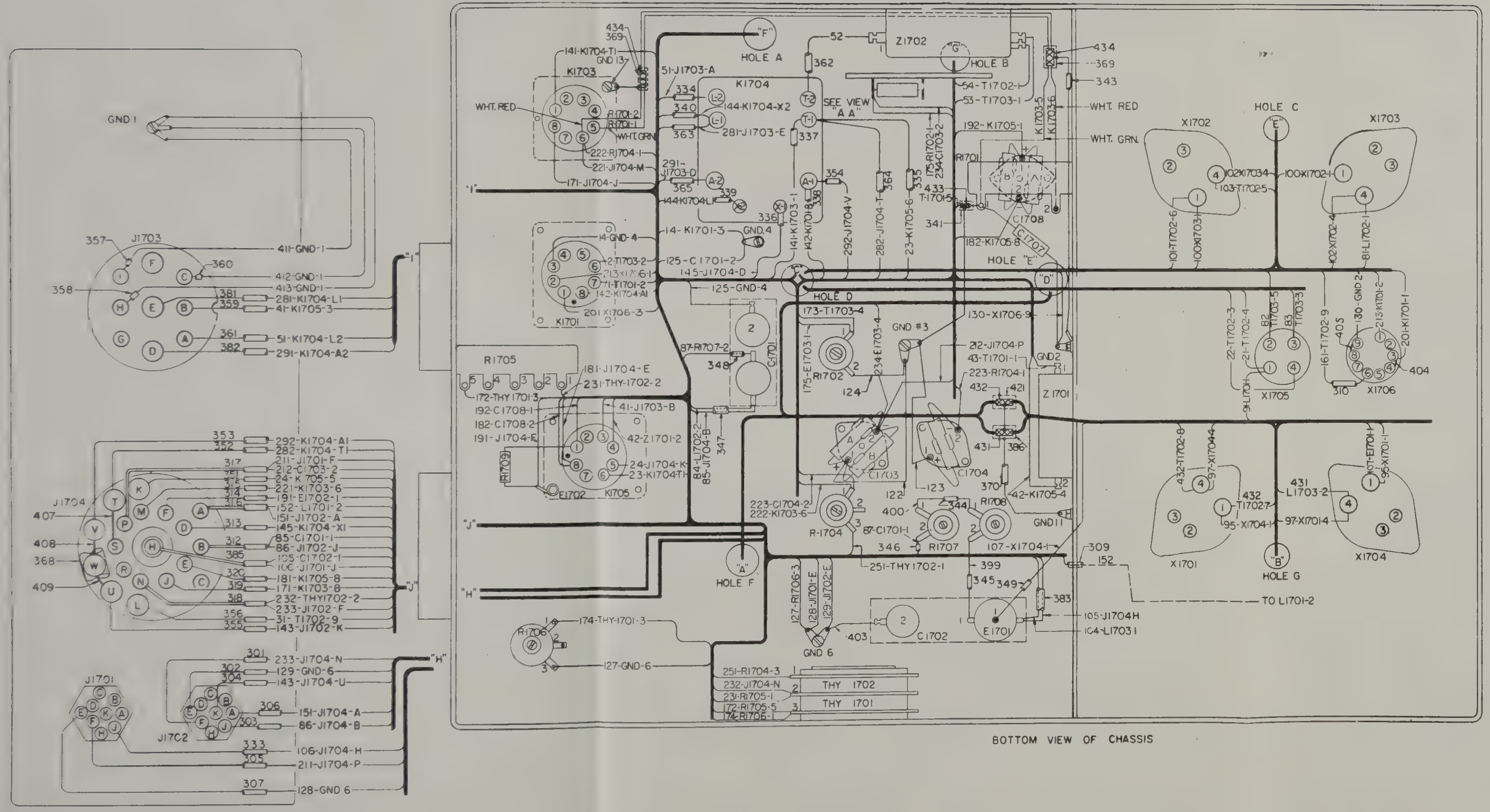
Figure 21-4. Power Supply PP-298/ARC-21X, Schematic Diagram

TABLE XCIV. TROUBLE ANALYSIS, POWER SUPPLY PP-298/ARC-21X

Circuit Breakdown, Schematic Diagram, Figure 21-4

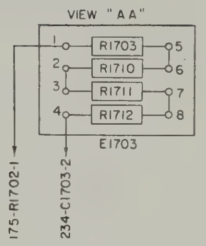
Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	12 (J1701)	Multimeter ME-75/ARC-21 plugged in. Selector switch at position 3	Radio Set Control C-451A/ARC-21 set for "VOICE" operation, "POWER" at "HI," "CONTROL" at "ON." Press microphone button	1040V (transmit)	K1704, L1703 K1705, C1702 Z1701 T1701 V1701, V1704 T1702, K1701
2	12 (J1701)	Same as step 1 Selector switch at position 6	Same as step 1	-20V	T1703, K1701 V1705 L1701, K1702 R1702, R1703 R1710 R1711 R1712 C1703
3	13 (J1702)	Same as step 1 Selector switch at position 3	Same as step 1 Press microphone button	400V (transmit)	V1702, V1703 L1702, T1702 C1701, T1701
4	13 (J1702)	Same as step 1 Selector switch at position 4	Same as step 1	140V	K1701, C1706 K1702 T1703, T1702 V1705 L1701
5	13 (J1702)	Same as step 1 Selector switch at position 6	Same as step 1	27.5V	d-c supply K1704
6	13 (J1702)	Same as step 1 Selector switch at position 7	Same as step 1 Press microphone button	-18V (transmit)	THY1701 R1706, C1704 R1704 THY1702 K1703, T1701 R1705

NOTE:
1 PIGTAIL FROM SHIELD 433 AT T1701-5.



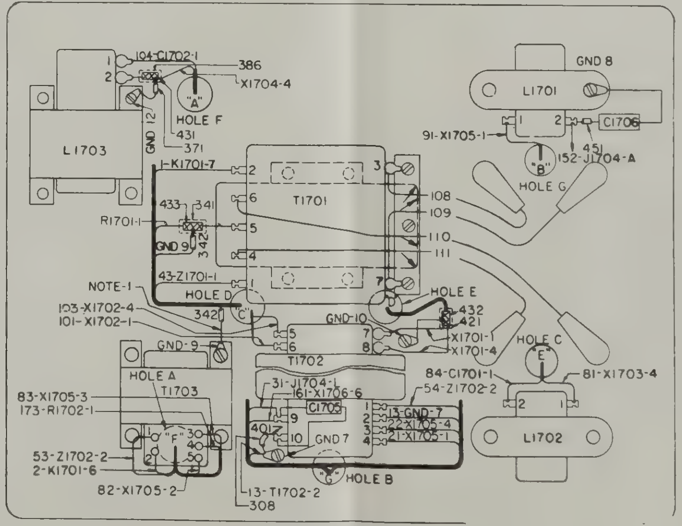
J1703
J1704
J1701
J1702
GND 1
K1703
K1704
K1701
K1705
R1705
R1702
R1704
R1706
R1707
R1708
E1701
E1702
C1701
C1702
C1703
C1704
C1708
Z1701
Z1702
X1701
X1702
X1703
X1704
X1705
X1706
THY 1701
THY 1702
HOLE A
HOLE B
HOLE C
HOLE D
HOLE F
HOLE G
SEE VIEW "AA"
WHT. RED
WHT. GRN
GND #3
GND 6
GND 11
TO L1701-2

BOTTOM VIEW OF CHASSIS



VIEW "AA"
R1703
R1710
R1711
R1712
E1703
175-R1702-1
234-C1703-2

WIRE NO. (INCLUSIVE)	DESCRIPTION COLOR AND CONDUCTOR
1-2	WIRE WHITE AWG 18 600V
11-14	WHT. BLK. TR
21-24	BRN.
31	ORN.
41-43	GRN.
51-54	WIRE WHT. BLU. TR. AWG 18 600V
81-87	WIRE WHT ORN TR AWG 20 600V
91-111	WIRE WHT RED TR.
122-130	WIRE WHT BLK TR. AWG24 600V
141-145	BRN
151-152	RED
161	ORN
171-175	YEL
181-182	BLK/BRN TR.
191-192	BLK/RED
201	BLK/GRN
211-213	YEL/BLK
221-223	YEL/RED
231-234	YEL/GRN
251	WIRE WHT GRN AWG24 600V
281-282	WIRE WHT BRN TR. AWG14 1000V
291-292	WIRE WHT YEL TR. AWG14 1000V
301-310	SLEEVING INS BLK .053 I.D
312-320	.095 I.D
333-349	.118 I.D
351-369	.148 I.D
381-383	.208 I.D
385-386	SLEEVING INS. BLK. .263 I.D
399-405	WIRE TINNED COPPER .032 DIA
407-409	WIRE WHT RED AWG 20 600V
411-413	WIRE WHT BLK AWG14 1000V
421	SLEEVING INS. BLK. .294 I.D.
431	CABLE SHIELDED
432	
433	
434	CABLE SHIELDED
451	SLEEVING INS. BLK. .034 I.D.



L1701
L1702
L1703
T1701
T1702
T1703
C1706
C1705
GND 8
GND 7
HOLE A
HOLE B
HOLE C
HOLE D
HOLE E
HOLE F
HOLE G
NOTE-1

TOP VIEW OF CHASSIS

Figure 21-5. Power Supply PP-298/ARC-21X, Connection Diagram

TABLE XCIV. TROUBLE ANALYSIS, POWER SUPPLY PP-298/ARC-21X

Circuit Breakdown, Schematic Diagram, Figure 21-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	12 (J1701)	Multimeter ME-75/ARC-21 plugged in. Selector switch at position 3	Radio Set Control C-451A/ARC-21 set for "VOICE" operation, "POWER" at "HI," "CONTROL" at "ON." Press microphone button	1040V (transmit)	K1704, L1703 K1705, C1702 Z1701 T1701 V1701, V1704 T1702, K1701
2	12 (J1701)	Same as step 1 Selector switch at position 6	Same as step 1	-20V	T1703, K1701 V1705 L1701, K1702 R1702, R1703 R1710 R1711 R1712 C1703
3	13 (J1702)	Same as step 1 Selector switch at position 3	Same as step 1 Press microphone button	400V (transmit)	V1702, V1703 L1702, T1702 C1701, T1701
4	13 (J1702)	Same as step 1 Selector switch at position 4	Same as step 1	140V	K1701, C1706 K1702 T1703, T1702 V1705 L1701
5	13 (J1702)	Same as step 1 Selector switch at position 6	Same as step 1	27.5V	d-c supply K1704
6	13 (J1702)	Same as step 1 Selector switch at position 7	Same as step 1 Press microphone button	-18V (transmit)	THY1701 R1706, C1704 R1704 THY1702 K1703, T1701 R1705

SECTION XXIA

MAINTENANCE INSTRUCTIONS FOR POWER SUPPLY PP-1831/ARC

21A-1. GENERAL.

21A-2. This power supply is used in installations where high-altitude operation is required. The supply is powered from a 115-volt a-c, 380- to 1000-cps single-phase source, and is housed in a pressurized case. Use at altitudes above 50,000 feet is possible due to the automatic action of an aneroid switch, which reduces the 1100-volt output of the power supply to approximately 750 volts. The aneroid switch (S4701) is pressure sensitive and will operate automatically when altitudes above 50,000 feet are attained.

21A-3. Blower motor B4701 operates when an ambient temperature of +40°C (+104°F) is attained; it serves to circulate the air inside of the power supply, maintaining a uniform temperature throughout.

21A-4. Power supplies PP-298/ARC-21X and PP-1831/ARC produce the same voltage output.

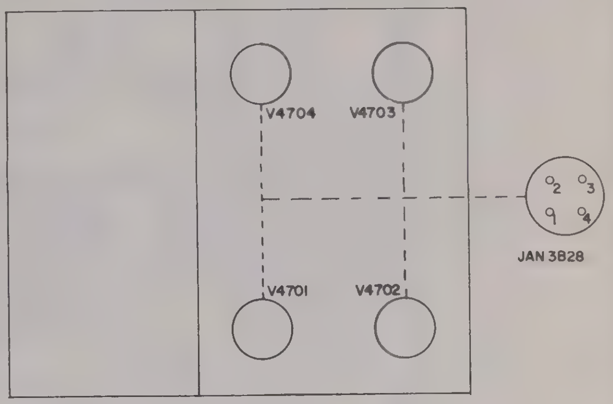


Figure 21A-1. Power Supply PP-1831/ARC, Tube Locations

TABLE XCIVA. POWER SUPPLY PP-1831/ARC, RESISTANCE MEASUREMENTS, TUBE SOCKETS V4701 THROUGH V4704, TO GROUND

NOTE

Conditions same as table XCIVB.

Symbol	Pins 1	2	3	4	Cap
V4701	inf	---	---	inf	inf
V4702	inf	---	---	inf	inf
V4703	inf	---	---	inf	inf
V4704	inf	---	---	inf	inf

21A-5. TROUBLE ANALYSIS.

21A-6. The following trouble analysis assumes that the fault has been confined to the power supply, by a previous substitution test in a working system or by some other logical means.

WARNING

> Voltages present in the power supply may prove fatal on contact. All repairs or replacements of tubes or integral parts must be accomplished with the power off.

21A-7. Thoroughly inspect a defective chassis for broken, burnt or other damaged parts, before an attempt is made to locate the defect by voltage and resistance checking. Resistance readings, from the various tubes and connectors to ground, appear on tables XCIVA and XCIVB. See figure 21A-4 for voltage values. Figures 21A-1 through 21A-5 may be used to identify component parts or for locating trouble in a defective power supply.

21A-8. Complete the visual inspection, and if the defect has not been located, connect the power supply into the bench test set-up (paragraphs 6-13 through 6-17). After completing the hook-up, refer to table XCIVC and proceed as described.

21A-9. CIRCUIT ANALYSIS.

21A-10. The voltages supplied to the AN/ARC-21 by the power supply are shown on figure 21A-4. Dynamotor Assembly DY-50/ARC-21 produces voltages identical to the PP-1831/ARC supply. Vacuum tube

TABLE XCIVB. POWER SUPPLY PP-1831/ARC, RESISTANCE MEASUREMENTS, CONNECTOR JACKS J4701 THROUGH J4705, TO GROUND

Circuit Breakdown, Connection Diagram, Figure 21A-5.

Symbol	Pins																						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
J4701	-	-	-	-	O	6K	-	-															
J4702	150K	-	-	-	O	2.2K	-	-															
J4703	inf	inf	O	inf	inf	-	-	O	-	O													
J4704	150K	20 meg	inf	inf	inf	inf	-	inf	-	inf	inf	0.3	3.8K	2.2K	-	6K	-	-	inf	inf	inf	inf	inf
J4705	inf																						

Conditions as follows:
All connecting cables removed, using 20,000 ohms-per-volt multimeter TS-352/U, or equivalent.
Resistance measurements designated as follows:
O = Continuity, K = 1,000 ohms, 1 meg = 1,000,000 ohms, inf = Infinite Resistance

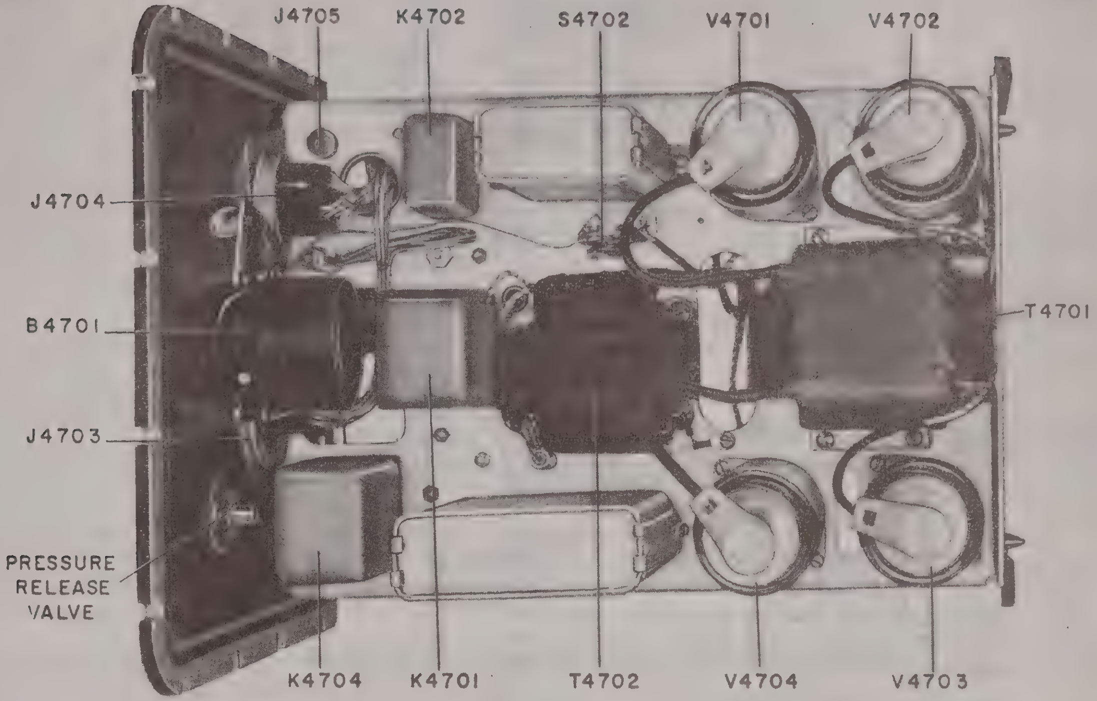

J4705
K4702
S4702
V4701
V4702
J4704
B4701
T4701
J4703
PRESSURE RELEASE VALVE
K4704
K4701
T4702
V4704
V4703

Figure 21A-2. Power Supply PP-1831/ARC, Top View

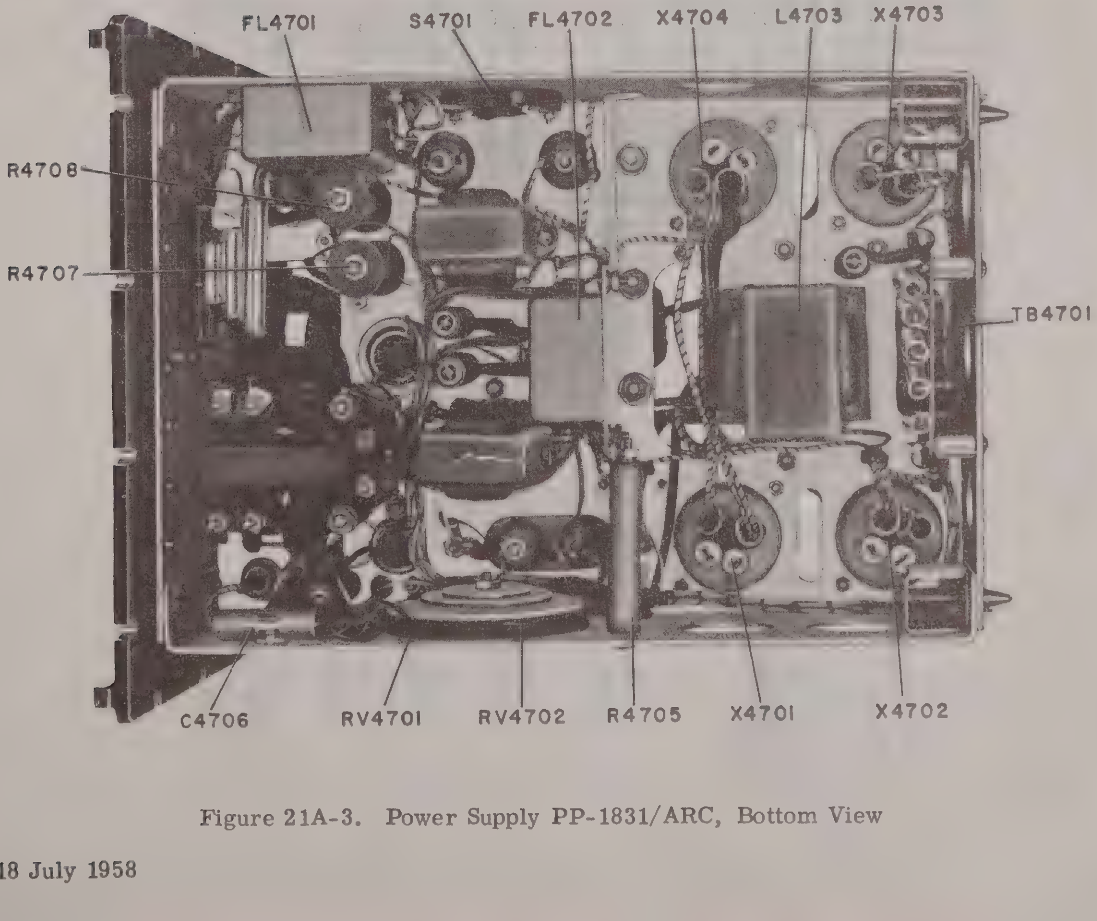

FL4701
S4701
FL4702
X4704
L4703
X4703
R4708
R4707
TB4701
C4706
RV4701
RV4702
R4705
X4701
X4702

Figure 21A-3. Power Supply PP-1831/ARC, Bottom View

TABLE XCIVC. TROUBLE ANALYSIS, POWER SUPPLY PP-1831/ARC

Circuit Breakdown, Schematic Diagram, Figure 21A-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	14 (J4705)	Clip Multimeter ME-75/ARC-21 ground lead to chassis frame. Red voltage probe to J4705. Selector switch at 1500 volts.	Radio set Control C-451A/ARC-21 set for "VOICE" operation. With "POWER" at "HI" and Control at "ON", depress microphone button.	1040 V (Transmit)	K4703, K4704, FL4701, T4701, V4701, V4704, T4702, L4703, C4702.
2	15 (J4701)	Multimeter ME-75/ARC-21 plugged in. Selector switch at position 7.	Same as step 1.	-20 V	K4703, FL4702, T4702, R4703, CR4702, C4709, R4710, R4711, C4704, C4703.
3	16 (J4702)	Same as step 2. Selector switch at position 3.	Same as step 1. Press microphone button.	400 V (Transmit)	K4703, K4704, FL4701, T4701, K4701, V4702, V4703, T4702, L4702, C4701.
4	16 (J4702)	Same as step 2. Selector switch at position 4.	Same as step 1.	140 V	K4703, FL4702, T4702, R4702, CR4701, R4712, R4713, C4710, C4711, L4701.
5	16 (J4702)	Same as step 2. Selector switch at position 6.	Same as step 1.	27.5 V	DC supply, K4703.
6	16 (J4702)	Same as step 2. Selector switch at position 7.	Same as step 1. Press microphone button.	-18 V (Transmit)	K4703, FL4701, T4701, R4701, K4702, C4706, C4705, RV4701, RV4702, R4704, R4705, R4706.

s and germanium-diode rectifiers, coupled -up transformers, produce the various pply voltages.

Input power plug J4703 receives the 115-V r, along with the 28-V d-c relay power used he power supply. The "MASTER CONTROL" located on the aircraft control panel, acti- 703, allowing filament power to be applied ing keying relay K4701 to close. Relay K4701 ain closed until the transmitter is keyed. e transmitter will cause the contacts of short out R4701. Full d-c power will then d to the power amplifier plates.

High altitude voltage-reduction relay K4701 ain deactivated until an altitude of 50,000 feet attained; at this time, aneroid switch S4701 e and K4701 will be activated. The high-volt- ary is arranged so that the closing of S4701 ect the primary of K4701 in series bucking of the windings of the filament transformer effectively reducing the 1100-volt output to ately 750 volts. Reduction in the 1100-volt educes the tendency of the power supply to hover) at high altitudes.

Blower motor B4701 remains off until the emperature reaches +40°C (+104°F); at this time thermal relay switch S4702 closes. The blower motor serves to circulate the air within the pressurized power supply case, maintaining a constant temperature throughout the supply.

21A-14. Line filters FL4702 and FL4701, filter the input voltage to the primary of the filament and high voltage transformers, respectively.

21A-15. Diode rectifier CR4701 rectifies the +140-volt line voltage producing, across load resistors R4712 and R4713, a d-c voltage which is used by the receiver.

21A-16. Load resistor R4711, in conjunction with CR4702, develops -20 volts dc, which is used in the receiver.

21A-17. Divider resistors R4707 and R4708 are used in conjunction with gas rectifiers V4701, V4702, V4703, and V4704, to produce a +400-volt and a +1000-volt source for external distribution.

21A-18. Voltages of -18 volts dc and -40 volts dc are developed across R4704, R4705, and R4706 for use in the modulator. Rectification for the -18 volt and -40 volt supplies is accomplished by the high-voltage rectifiers and associated transformer.

TABLE XCIVC. TROUBLE ANALYSIS, POWER SUPPLY PP-1831/ARC

Circuit Breakdown, Schematic Diagram, Figure 21A-4

Step	Major Test Point	Test Equipment Control Settings	AN/ARC-21 Control Settings	Normal Indication	Possible Cause of Abnormal Indication
1	14 (J4705)	Clip Multimeter ME-75/ARC-21 ground lead to chassis frame. Red voltage probe to J4705. Selector switch at 1500 volts.	Radio set Control C-451A/ARC-21 set for "VOICE" operation. With "POWER" at "HI" and Control at "ON", depress microphone button.	1040 V (Transmit)	K4703, K4704, FL4701, T4701, V4701, V4704, T4702, L4703, C4702.
2	15 (J4701)	Multimeter ME-75/ARC-21 plugged in. Selector switch at position 7.	Same as step 1.	-20 V	K4703, FL4702, T4702, R4703, CR4702, C4709, R4710, R4711, C4704, C4703.
3	16 (J4702)	Same as step 2. Selector switch at position 3.	Same as step 1. Press microphone button.	400 V (Transmit)	K4703, K4704, FL4701, T4701, K4701, V4702, V4703, T4702, L4702, C4701.
4	16 (J4702)	Same as step 2. Selector switch at position 4.	Same as step 1.	140 V	K4703, FL4702, T4702, R4702, CR4701, R4712, R4713, C4710, C4711, L4701.
5	16 (J4702)	Same as step 2. Selector switch at position 6.	Same as step 1.	27.5 V	DC supply, K4703.
6	16 (J4702)	Same as step 2. Selector switch at position 7.	Same as step 1. Press microphone button.	-18 V (Transmit)	K4703, FL4701, T4701, R4701, K4702, C4706, C4705, RV4701, RV4702, R4704, R4705, R4706.

rectifiers and germanium-diode rectifiers, coupled with step-up transformers, produce the various power supply voltages.

21A-11. Input power plug J4703 receives the 115-V a-c power, along with the 28-V d-c relay power used to start the power supply. The "MASTER CONTROL" switch, located on the aircraft control panel, activates K4703, allowing filament power to be applied and causing keying relay K4701 to close. Relay K4701 will remain closed until the transmitter is keyed. Keying the transmitter will cause the contacts of K4701 to short out R4701. Full d-c power will then be applied to the power amplifier plates.

21A-12. High altitude voltage-reduction relay K4701 will remain deactivated until an altitude of 50,000 feet has been attained; at this time, aneroid switch S4701 will close and K4701 will be activated. The high-voltage primary is arranged so that the closing of S4701 will connect the primary of K4701 in series bucking with one of the windings of the filament transformer (T4702), effectively reducing the 1100-volt output to approximately 750 volts. Reduction in the 1100-volt supply reduces the tendency of the power supply to leak (flashover) at high altitudes.

21A-13. Blower motor B4701 remains off until the ambient temperature reaches +40°C (+104°F); at this time thermal relay switch S4702 closes. The blower motor serves to circulate the air within the pressurized power supply case, maintaining a constant temperature throughout the supply.

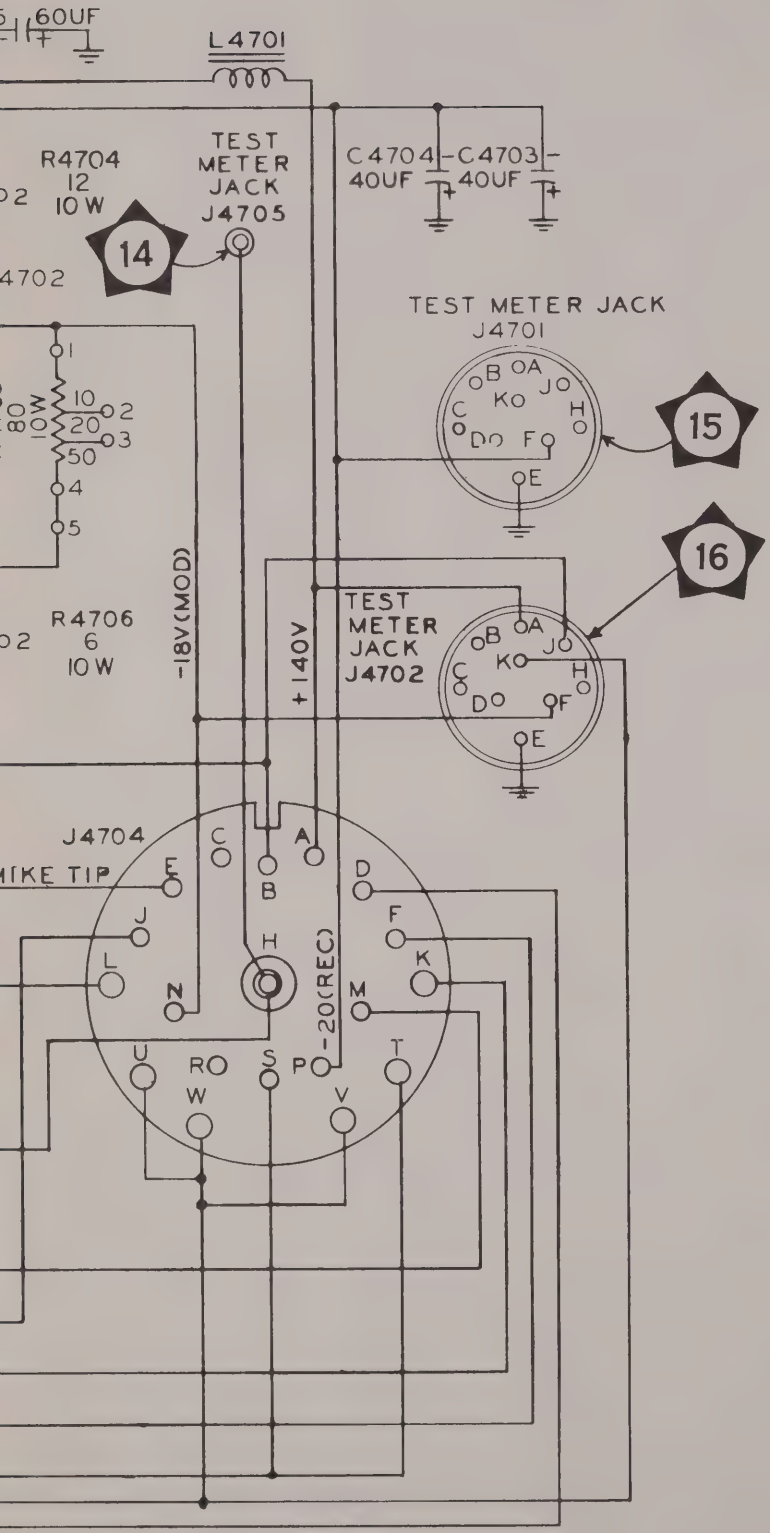
21A-14. Line filters FL4702 and FL4701, filter the input voltage to the primary of the filament and high voltage transformers, respectively.

21A-15. Diode rectifier CR4701 rectifies the +140-volt line voltage producing, across load resistors R4712 and R4713, a d-c voltage which is used by the receiver.

21A-16. Load resistor R4711, in conjunction with CR4702, develops -20 volts dc, which is used in the receiver.

21A-17. Divider resistors R4707 and R4708 are used in conjunction with gas rectifiers V4701, V4702, V4703, and V4704, to produce a +400-volt and a +1000-volt source for external distribution.

21A-18. Voltages of -18 volts dc and -40 volts dc are developed across R4704, R4705, and R4706 for use in the modulator. Rectification for the -18 volt and -40 volt supplies is accomplished by the high-voltage rectifiers and associated transformer.


60UF
L4701
R4704
12
10W
TEST
METER
JACK
J4705
14
C4704
40UF
C4703
40UF
4702
TEST METER JACK
J4701
A
B
C
D
E
F
H
J
K
15
16
1
2
3
4
5
10
20
50
80W
10
-18V(MOD)
+140V
R4706
6
10W
TEST
METER
JACK
J4702
J4704
IKE TIP
C
A
B
D
E
F
H
J
K
L
M
N
P
R
S
T
U
V
W
-20(REC)

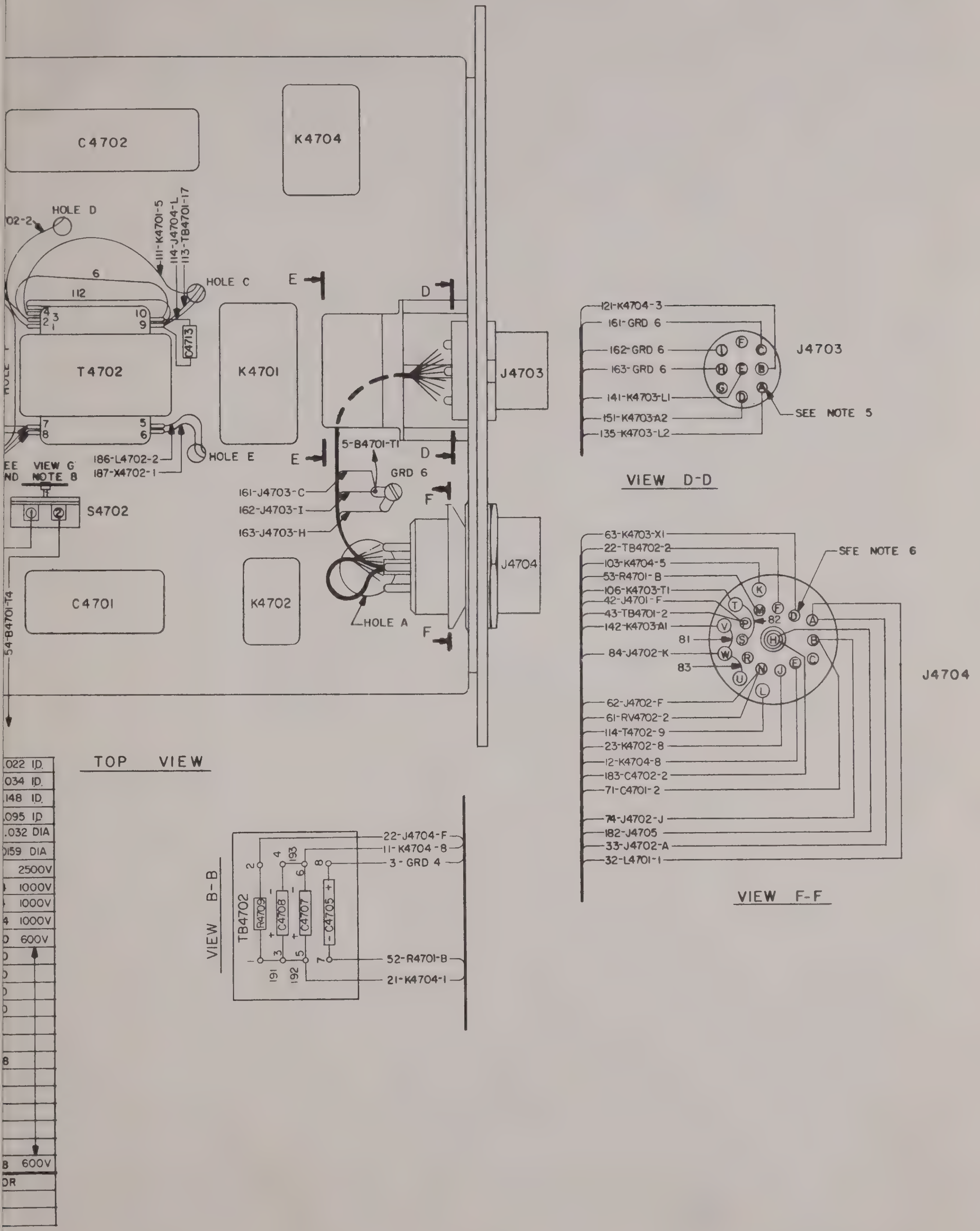

C4702
K4704
02-2
HOLE D
111-K4701-5
114-J4704-L
113-TB4701-17
6
112
HOLE C
E
D
4
3
2
1
10
9
C4713
T4702
K4701
J4703
HOLE
7
8
5
6
186-L4702-2
187-X4702-1
HOLE E
5-B4701-T1
GRD 6
EE VIEW G
ND NOTE 8
S4702
①
②
161-J4703-C
162-J4703-I
163-J4703-H
F
J4704
54-B4701-T4
C4701
K4702
HOLE A
TOP VIEW
121-K4704-3
161-GRD 6
162-GRD 6
163-GRD 6
141-K4703-L1
151-K4703-A2
135-K4703-L2
F C I H E B G D A
SEE NOTE 5
VIEW D-D
63-K4703-X1
22-TB4702-2
103-K4704-5
53-R4701-B
106-K4703-T1
42-J4701-F
43-TB4701-2
142-K4703-A1
81
84-J4702-K
83
62-J4702-F
61-RV4702-2
114-T4702-9
23-K4702-8
12-K4704-8
183-C4702-2
71-C4701-2
74-J4702-J
182-J4705
33-J4702-A
32-L4701-1
K T M F D A P 82 V S H B W R C N E J U L
SFE NOTE 6
VIEW F-F
VIEW B-B
TB4702
R4709
C4708
C4707
C4705
2
4
193
6
8
3
5
7
191
192
22-J4704-F
11-K4704-8
3-GRD 4
52-R4701-B
21-K4704-1
.022 ID.
.034 ID.
.148 ID.
.095 ID
.032 DIA
0159 DIA
2500V
1000V
1000V
4 1000V
0 600V
8
8 600V
OR

Figure 21A-5. Power Supply PP-1831/ARC, Connection Diagram

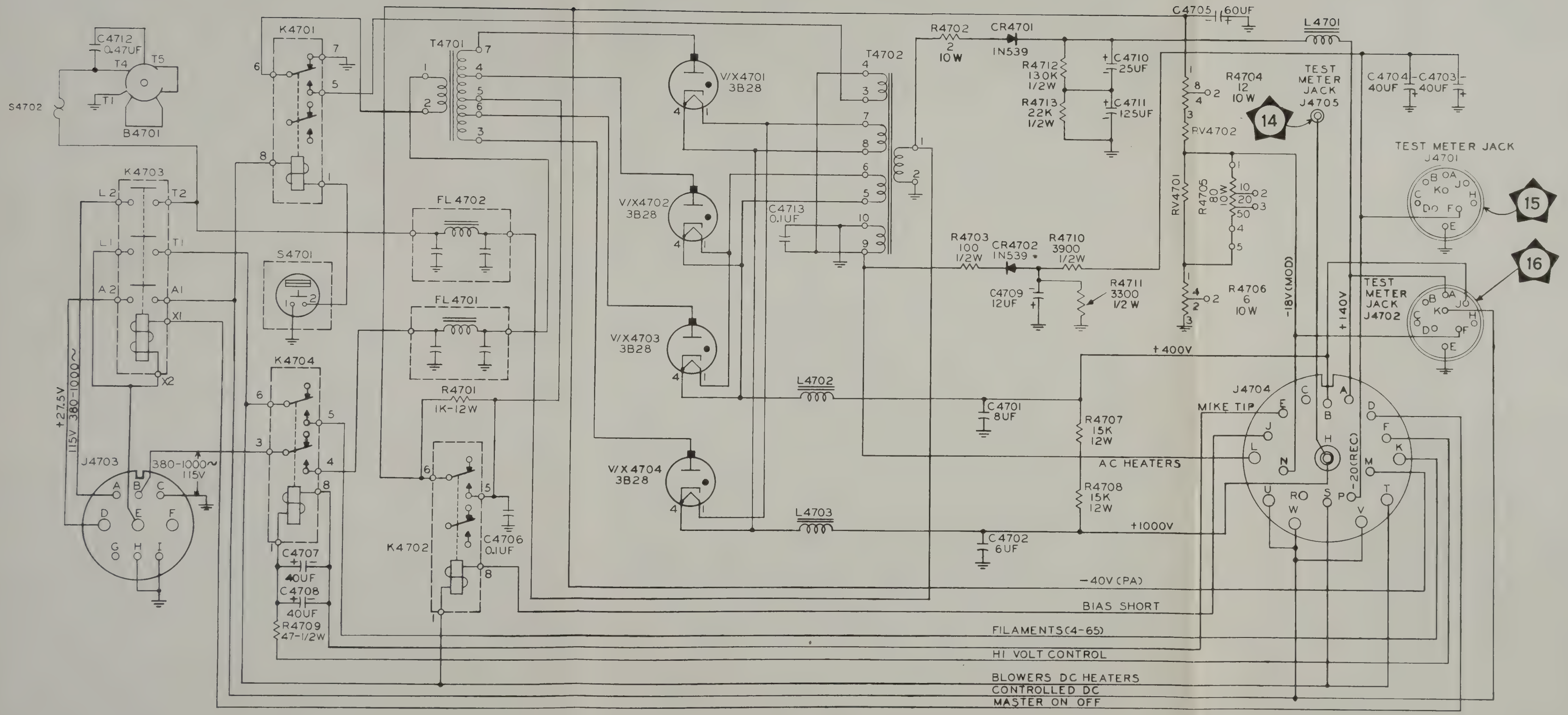
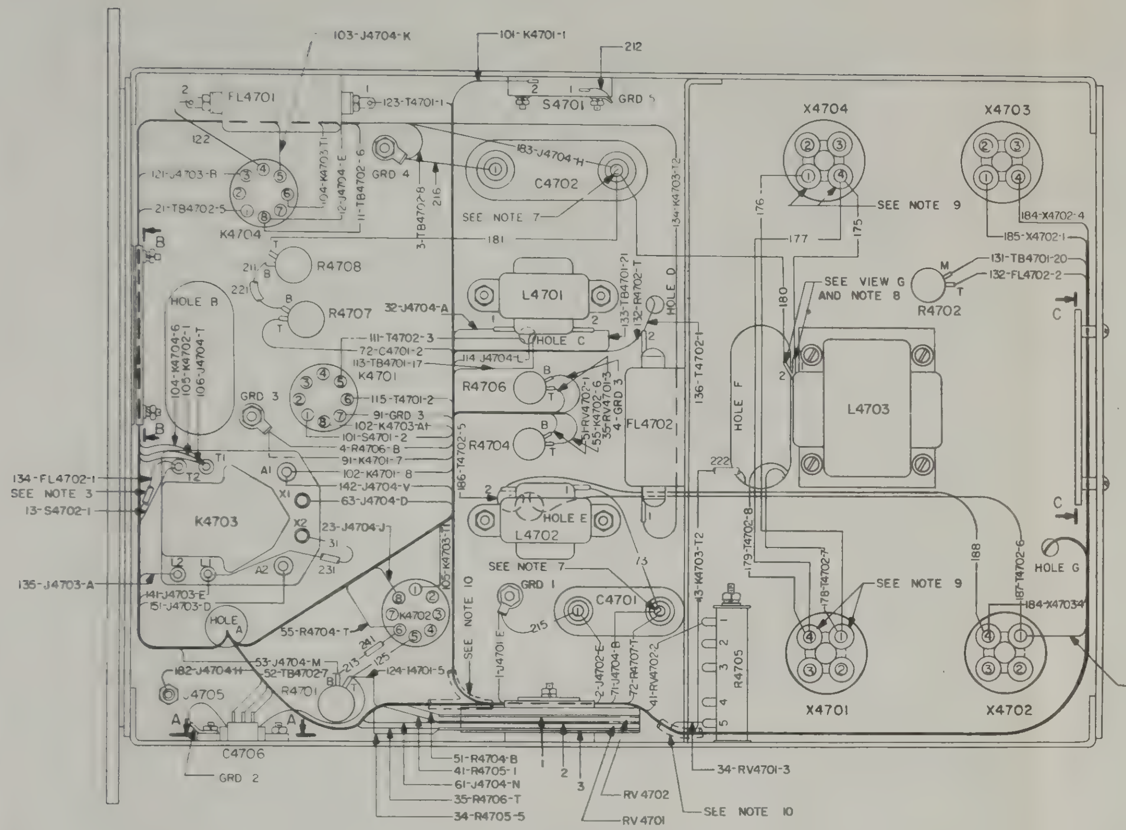
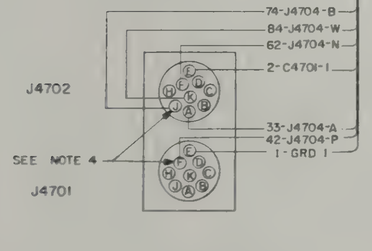

C4712
0.47UF
T4
T5
T1
S4702
B4701
K4701
6
7
5
8
1
T4701
1
2
7
4
5
6
3
V/X4701
3B28
4
1
V/X4702
3B28
V/X4703
3B28
V/X4704
3B28
T4702
4
3
7
8
6
5
10
9
1
2
C4713
0.1UF
R4702
2
10W
CR4701
1N539
R4712
130K
1/2W
R4713
22K
1/2W
C4710
25UF
C4711
125UF
C4705
60UF
L4701
C4704
40UF
C4703
40UF
R4704
12
10W
RV4702
8
4
2
3
TEST
METER
JACK
J4705
14
TEST METER JACK
J4701
15
B
A
J
K
C
H
D
F
E
16
TEST
METER
JACK
J4702
RV4701
R4705
80
10W
10
20
50
4
5
2
3
R4706
6
10W
-18V(MOD)
+140V
K4703
L2
T2
L1
T1
A2
A1
X1
X2
FL4702
FL4701
S4701
2
R4703
100
1/2W
CR4702
1N539
R4710
3900
1/2W
C4709
12UF
R4711
3300
1/2W
K4704
6
5
3
4
8
R4701
1K-12W
K4702
6
5
8
1
C4706
0.1UF
C4707
40UF
C4708
40UF
R4709
47-1/2W
L4702
L4703
C4701
8UF
C4702
6UF
+400V
R4707
15K
12W
AC HEATERS
R4708
15K
12W
+1000V
J4704
MIKE TIP
C
A
B
D
E
F
J
H
K
L
N
M
U
RO
S
P
T
W
V
-20(REC)
+27.5V
115V 380-1000~
J4703
380-1000~
115V
A
B
C
D
E
F
G
H
I
-40V (PA)
BIAS SHORT
FILAMENTS(4-65)
HI VOLT CONTROL
BLOWERS DC HEATERS
CONTROLLED DC
MASTER ON OFF

Figure 21A-4. Power Supply PP-1831/ARC, Schematic Diagram

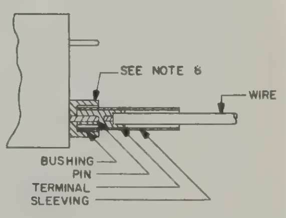
Revised 18 July 1958


103-J4704-K
101-K4701-1
212
FL4701
123-T4701-1
S4701
GRD 5
X4704
X4703
C4702
K4704
R4708
R4707
HOLE B
K4701
GRD 3
GRD 4
SEE NOTE 7
SEE NOTE 9
SEE VIEW G AND NOTE 8
L4701
HOLE C
HOLE D
R4702
R4706
R4704
L4703
FL4702
HOLE F
K4703
L4702
HOLE E
C4701
HOLE G
SEE NOTE 10
R4705
X4701
X4702
R4701
4705
C4706
GRD 2
134-FL4702-1
SEE NOTE 3
13-S4702-1
135-J4703-A
185-X4703-1
34-RV4701-3
RV 4702
RV4701
SEE NOTE 10
51-R4704-B
41-R4705-1
61-J4704-N
35-R4706-T
34-R4705-5

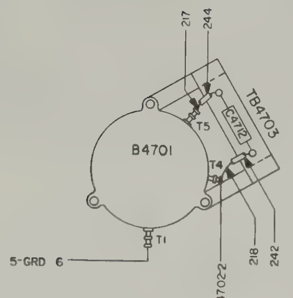
BOTTOM VIEW


74-J4704-B
84-J4704-W
62-J4704-N
2-C4701-1
33-J4704-A
42-J4704-P
1-GRD 1
J4702
SEE NOTE 4
J4701

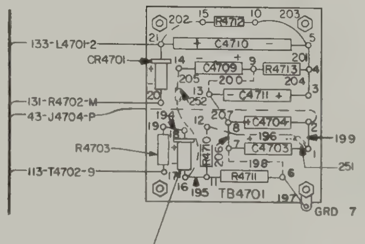
VIEW A-A


SEE NOTE 8
WIRE
BUSHING
PIN
TERMINAL
SLEEVING

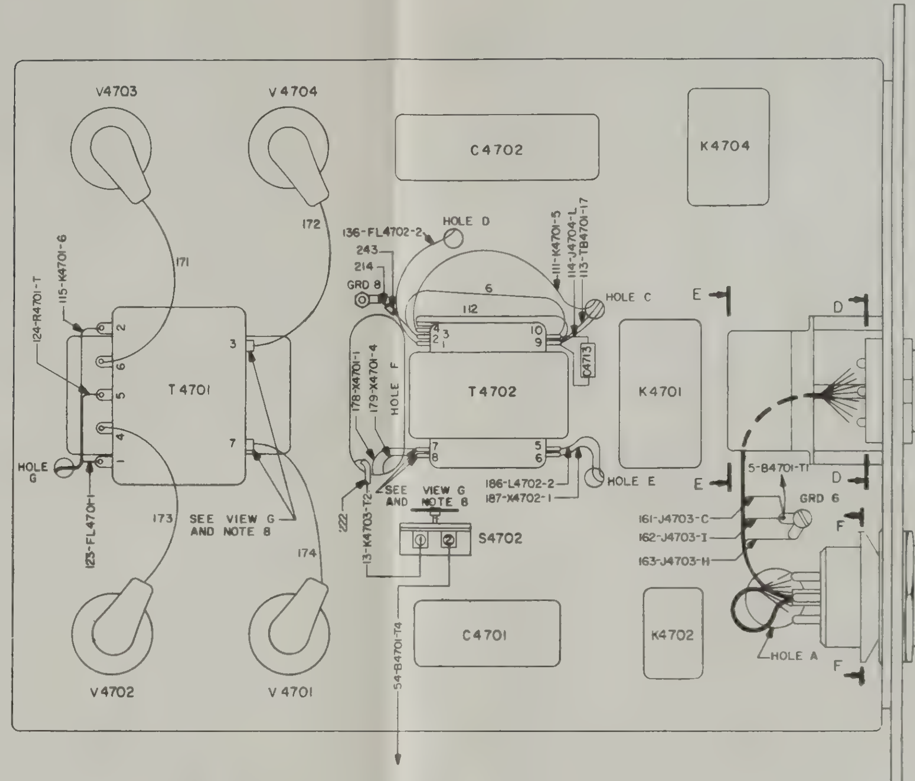
VIEW G


217
244
TB4703
B4701
T5
T4
T1
5-GRD 6
54-S4702-2
218
242

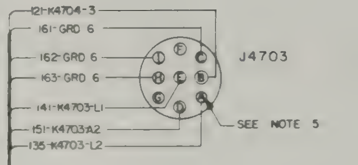
VIEW E-E


133-L4701-2
CR4701
131-R4702-M
43-J4704-P
R4703
113-T4702-9
R4702
C4710
C4709
R4713
C4711
C4704
C4703
R4711
TB4701
199
251
GRD 7

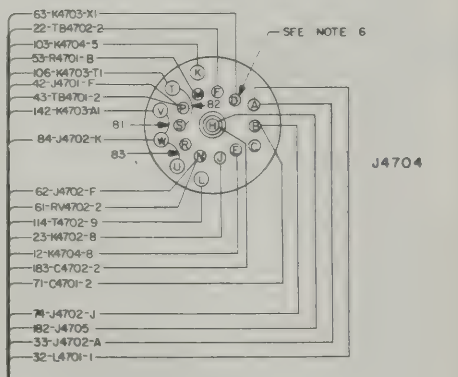
VIEW C-C


V4703
V4704
C4702
K4704
136-FL4702-2
HOLE D
GRD 8
HOLE C
T4701
T4702
K4701
J4703
HOLE B
SEE VIEW G AND NOTE 8
S4702
186-L4702-2
187-X4702-1
HOLE E
5-B4701-T1
GRD 6
161-J4703-C
162-J4703-I
163-J4703-H
J4704
C4701
K4702
HOLE A
V4702
V4701
54-B4701-T4

TOP VIEW


121-K4704-3
161-GRD 6
162-GRD 6
163-GRD 6
141-K4703-L1
151-K4703-A2
135-K4703-L2
J4703
SEE NOTE 5

VIEW D-D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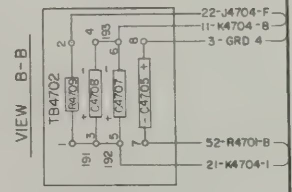
22-TB4702-2
103-K4704-5
53-R4701-B
106-K4703-T1
42-J4701-F
43-TB4701-2
142-K4703-A1
84-J4702-K
62-J4702-F
61-RV4702-2
114-T4702-9
23-R4702-8
12-K4704-8
183-C4702-2
71-C4701-2
74-J4702-J
182-J4705
33-J4702-A
32-L4701-1
SEE NOTE 6
J4704

VIEW F-F


TB4702
R4708
C4708
C4707
C4705
22-J4704-F
11-K4704-B
3-GRD 4
52-R4701-B
21-K4704-1

VIEW B-B

NOTES-

1-CRIMP AND SOLDER ALL ELECTRICAL CONNECTIONS USING SOLDER

2-FORM AND LACE ALL CABLES USING LACING TAPE

3-COVER ALL TERMINALS OF K4703 WITH SLEEVING

4-COVER ALL USED TERMINALS OF J4701 AND J4702 WITH SLEEVING

5-AT J4703 TERMINALS D,E,&F TO BE COVERED WITH SLEEVING TERMINALS A,B,C,H, AND I WITH

6-AT J4704 COVER ALL USED TERMINALS WITH SLEEVING

7-COVER TERMINALS OF C4701-2 AND C4702-2 WITH SLEEVING EXCEPT TERMINAL CONNECTED TO LEAD 180.

8-CRIMP AND SOLDER TERMINAL TO WIRE WHEN TERMINAL IS PLACED OVER PINS OF T4701-3,7, T4702-7,8, AND L4703-1,2 CRIMP AND SOLDER TO SECURE. AFTER INSPECTION, APPLY STAKING COMPOUND TO OUTSIDE OF SLEEVING APPROX. 1/8 INCH FROM END. THEN SLIDE SLEEVING INTO BUSHING. CUT SLEEVING SO AS TO COVER FULL LENGTH OF LEADS.

9-CUT SLEEVING TO A LENGTH OF 1 INCH. PUT SLEEVING OVER WIRE & SOLDER THEN APPLY STAKING COMPOUND TO OUTSIDE OF TERMINALS 1 & 4 OF X4701 & X4704. THEN SLIDE SLEEVING OVER TERMINALS.

10-CABLE TO BE TAPED

11-AFTER ASSEMBLY APPLY GLYPTAL (ITEM 120) TO ALL TERMINALS OF T4701, 1 & 2 OF L4703 AND 7 & 8 OF T4702.

WIRE NO. INCLUSIVE	COLOR AND CONDUCTOR DESCRIPTION
251 - 252	SLEEVING INSUL. BLK. .022 ID.
241 - 244	SLEEVING INSUL. BLK. .034 ID.
231	SLEEVING INSUL. BLK. .148 ID.
221 - 222	SLEEVING INSUL. BLK. .095 ID
211 - 218	WIRE TINNED COPPER .032 DIA
191 - 207	TINNED COPPER .0159 DIA
171 - 188	WHT/RED TR. 2500V
161 - 163	BLK 19/.014 1000V
151	YEL 19/.014 1000V
141 - 142	BRN 19/.014 1000V
131 - 136	BLU 19/.010 600V
121 - 125	GRN 19/.010
111 - 115	ORN 19/.010
101 - 106	BRN 19/.010
91	BLK 19/.010
81 - 84	RED TR 7/.012
71 - 74	ORN TR 7/.012
61 - 63	YEL/GRN TR 7/.008
51 - 55	YEL/RED
41 - 43	YEL/BLK
31 - 35	BLK/GRN
21 - 23	BLK/RED
11 - 13	BLK/BRN TR
1 - 6	WIRE WHT/BLK TR 7/.008 600V

WIRE TABLE

Figure 21A-5. Power Supply PP-1831/ARC, Connection Diagram

SECTION XXII

MAINTENANCE INSTRUCTIONS FOR RADIO SET CONTROL C-455/ARC

22-1. TROUBLE ANALYSIS.

22-2. Trouble in Radio Set Control C-455/ARC can best be located by circuit check. Use the schematic diagram, figure 22-2, as a guide. On completion of repairs try the radio set control in the bench test setup trying all operations including channel changes. The latter is necessary to check the channel coding system.

22-3. CIRCUIT ANALYSIS.

22-4. Since this control operates on voice only, the controls on the panel will all be connected in the circuits when the "CONTROL" switch S1402 is turned to "ON." Terminal 10 is the rotor contact making a common ground for all contacts made by this switch section. Terminal 2 on switch S1402A energizes the trip coil at any other control position momentarily, returning the remote "CONTROL" switch to "OFF."

22-5. Terminal 11 turns on the master on-off relay. This particular contact is used to hold the relay "on" when taking control from another position to prevent the relay from dropping out and starting a new start cycle. Terminal 12 connects the "POWER" switch, S1403, in the circuit making it usable. Terminal 8 inserts the "NOISE" control, resistor R1402, in the squelch control circuits.

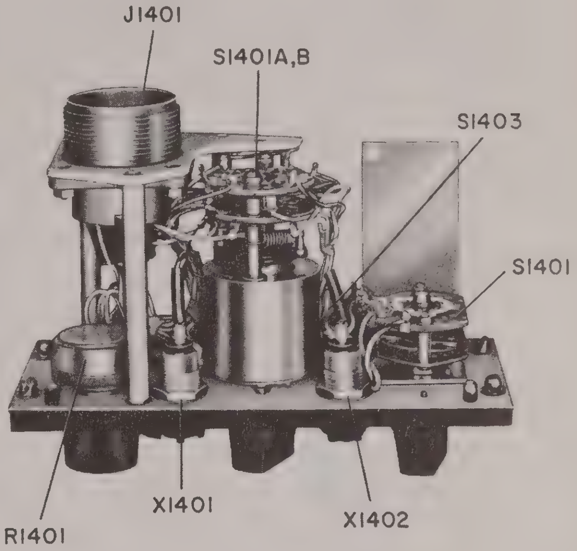


Figure 22-1. Radio Set Control C-455/ARC, Interior

22-6. The front of switch S1402B connects three of the five coding travelers to the decoding switch, S1303, in the Radio Set Control C-451A/ARC-21. The other two coding travelers are connected by terminals 10 and 6 of switch S1402B, rear. Terminals 2 and 4 connect the "VOLUME" control, resistor R1401 in the control circuits. Switch S1401 front and rear is the channel coding switch. The contacts and wiring are arranged in such a manner to close the ground circuit of relay K1301, in the Radio Set Control C-451A/ARC-21 causing the ratchet motor B1302 to turn the drums until the desired channel is selected and the system is balanced.

22-7. The trip coil K1401 is energized momentarily to return the "CONTROL" switch to the "OFF" position when another operating position takes over control. The two panel lamps, I1401 and I1402, are energized through an external brilliance control not supplied as part of this equipment.

ROTORS VIEWED FROM KNOB
SITIONED FOR CHANNEL 1.
TION NON-SHORTING

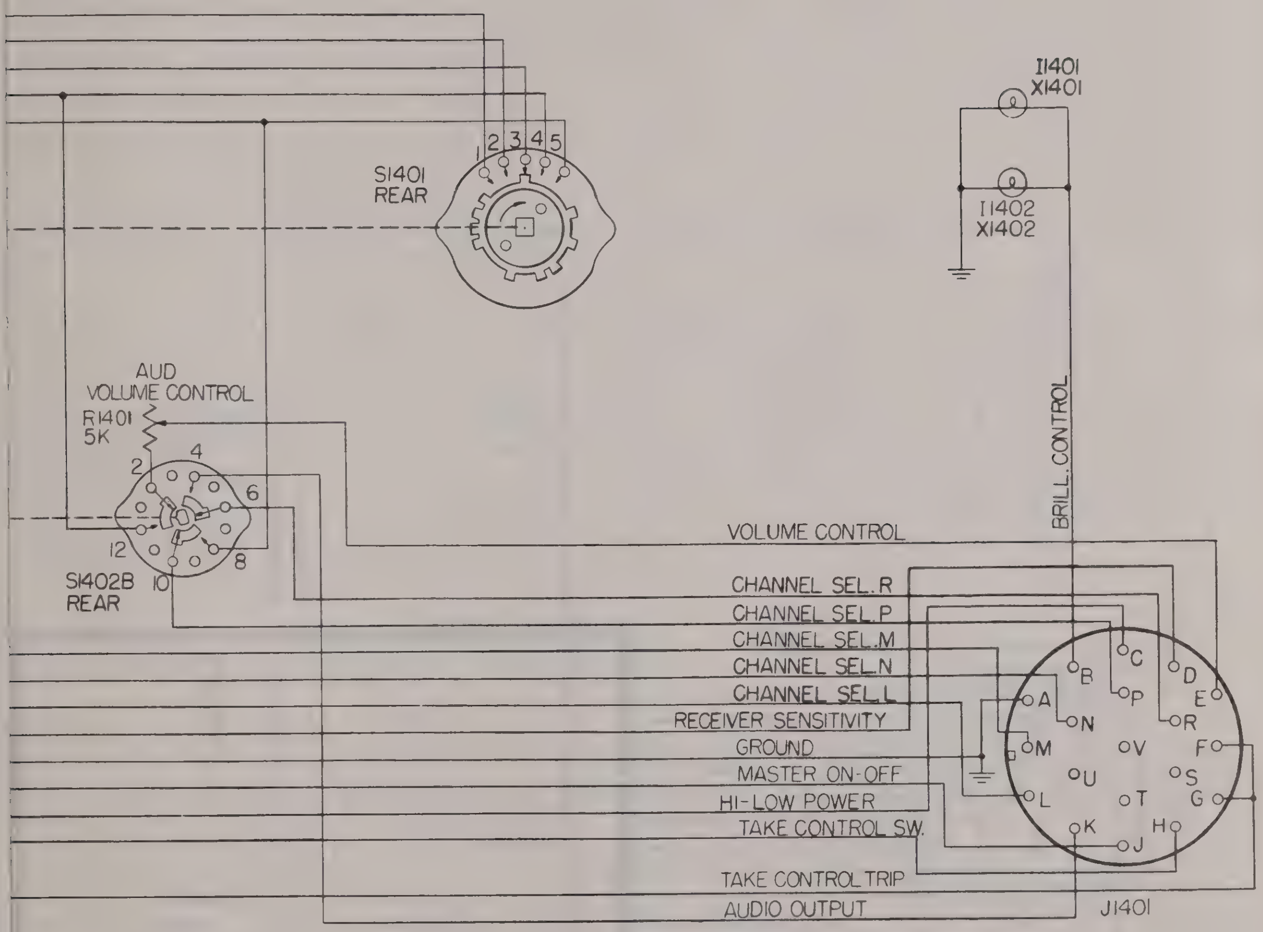

I1401
X1401
I1402
X1402
1
2
3
4
5
S1401
REAR
AUD
VOLUME CONTROL
R1401
5K
2
4
6
8
10
12
S1402B
REAR
BRILL. CONTROL
VOLUME CONTROL
CHANNEL SEL. R
CHANNEL SEL. P
CHANNEL SEL. M
CHANNEL SEL. N
CHANNEL SEL. L
RECEIVER SENSITIVITY
GROUND
MASTER ON-OFF
HI-LOW POWER
TAKE CONTROL SW.
TAKE CONTROL TRIP
AUDIO OUTPUT
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
J1401

Figure 22-2. Radio Set Control C-455/ARC, Schematic Diagram

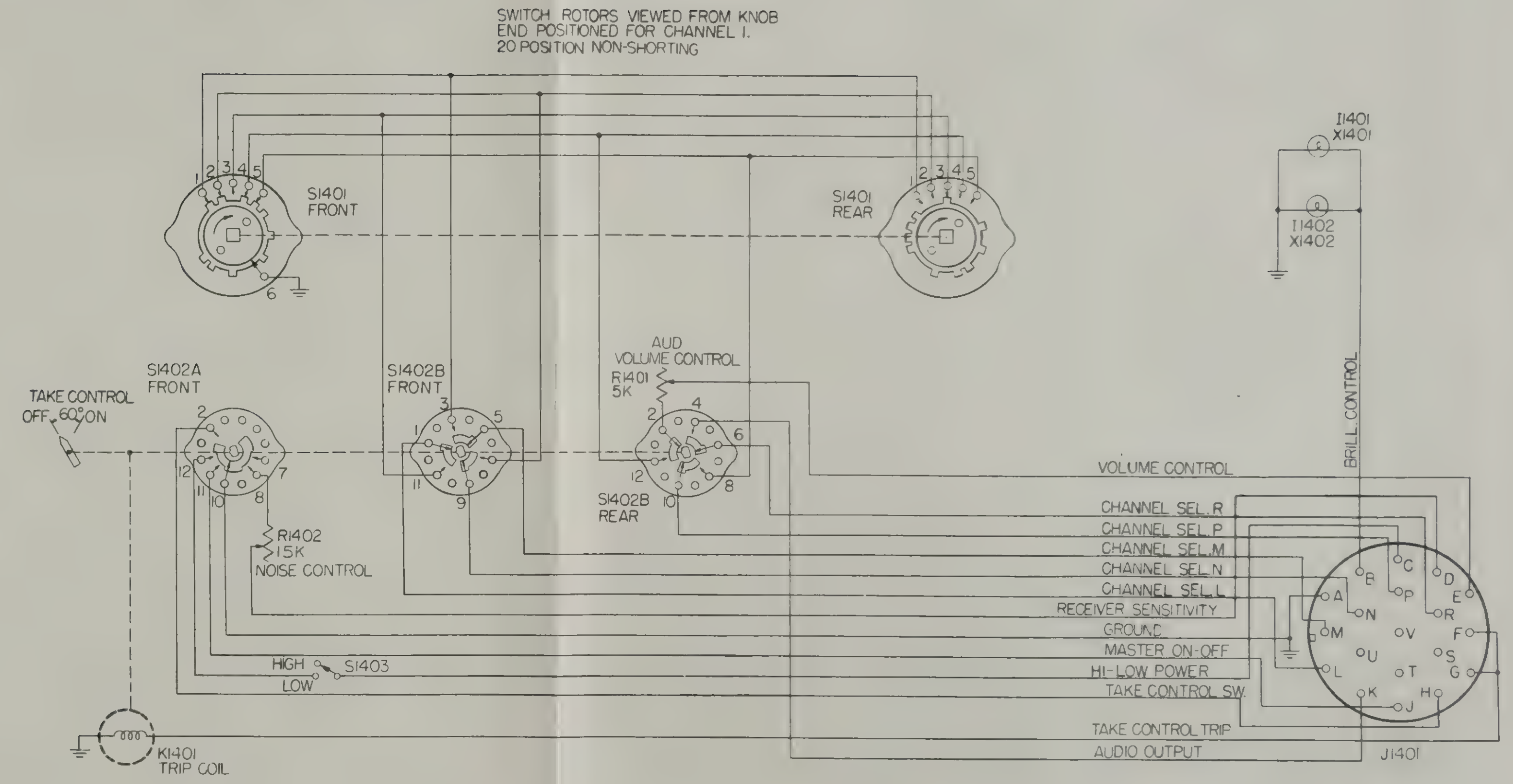
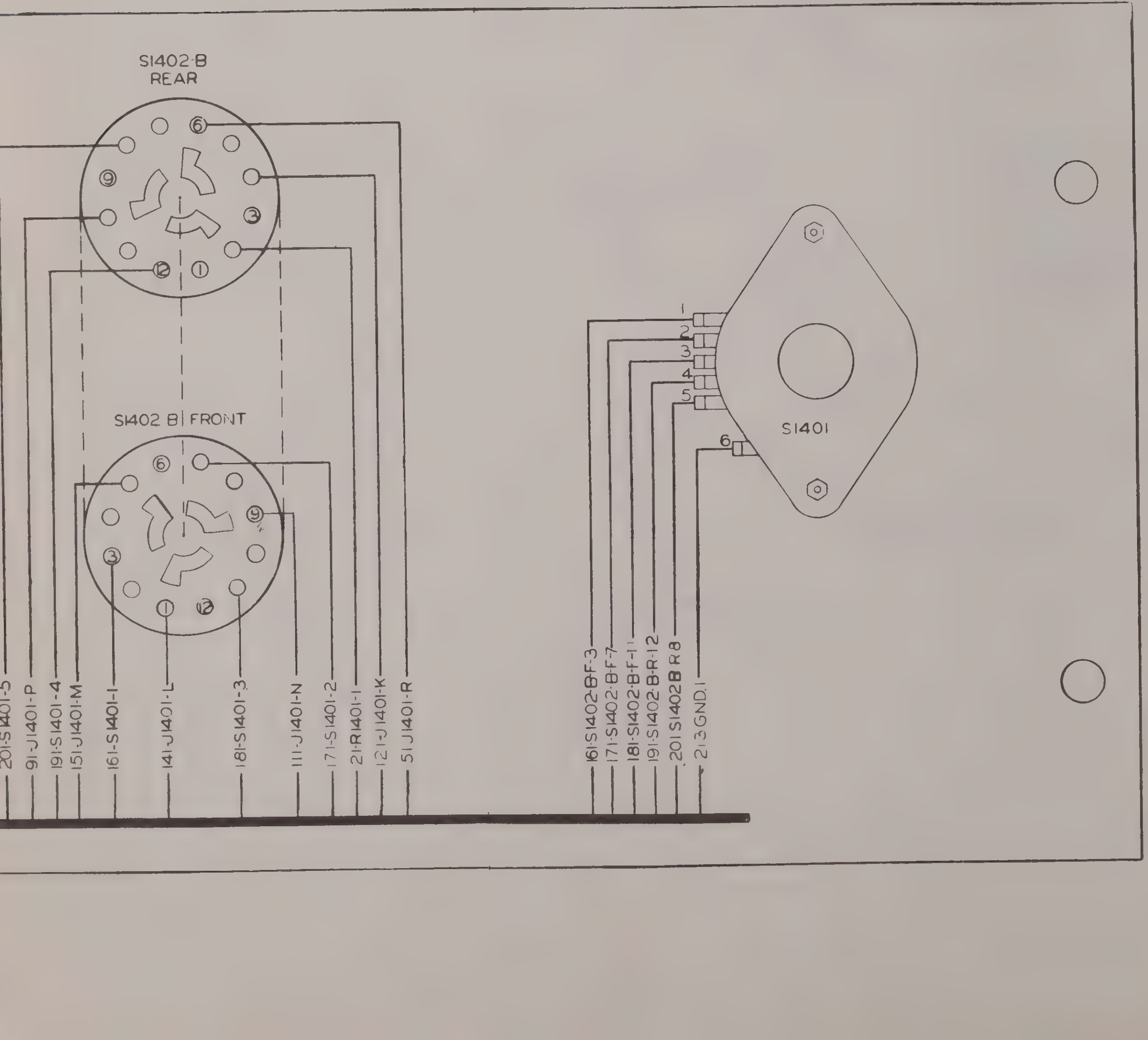

SWITCH ROTORS VIEWED FROM KNOB
END POSITIONED FOR CHANNEL I.
20 POSITION NON-SHORTING
1 2 3 4 5
S1401
FRONT
6
1 2 3 4 5
S1401
REAR
I1401
X1401
I1402
X1402
TAKE CONTROL
OFF 60° ON
S1402A
FRONT
2
7
12
11
10
8
R1402
15K
NOISE CONTROL
S1402B
FRONT
3
5
1
11
9
AUD
VOLUME CONTROL
R1401
5K
2
4
6
12
10
8
S1402B
REAR
HIGH
LOW
S1403
K1401
TRIP COIL
BRILL. CONTROL
VOLUME CONTROL
CHANNEL SEL. R
CHANNEL SEL. P
CHANNEL SEL. M
CHANNEL SEL. N
CHANNEL SEL. L
RECEIVER SENSITIVITY
GROUND
MASTER ON-OFF
HI-LOW POWER
TAKE CONTROL SW.
TAKE CONTROL TRIP
AUDIO OUTPUT
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
T
U
V
J1401

Figure 22-2. Radio Set Control C-455/ARC, Schematic Diagram

WIRE TABLE	
WIRE NOS INCLUSIVE	DESCRIPTION
	COLOR AND CONDUCTOR
1	WIRE WHT BLK/BRN TR 7/008
11-12	BLK/RED
21	BLK GRN
31	BRN/RED
41	BRN GRN
51	BRN/BLU
61	RED/BLK
7	RED/GRN
81	RED/BLU
91	YEL/BLK
101	YEL/RED
111	YEL/GRN
121	GRN/BLK
131-132	GRN/BRN
141	GRN/RED
151	BLU/BRN
161	WHT BLU/BLK TR
171	BLK
181	BRN
191	RED
201	ORN
211-213	WIRE WHT-BLK TR 7/008


S1402-B
REAR
S1402 B FRONT
S1401
1
2
3
4
5
6
201-S1401-5
91-J1401-P
191-S1401-4
151-J1401-M
161-S1401-1
141-J1401-L
181-S1401-3
111-J1401-N
171-S1401-2
21-R1401-1
121-J1401-K
51-J1401-R
161-S1402-B-F-3
171-S1402-B-F-7
181-S1402-B-F-11
191-S1402-B-R-12
201 S1402 B R 8
213 GND.1

SECTION XXIII

MAINTENANCE INSTRUCTIONS FOR ADAPTER KEYER GROUP CY-1279A/ARC

23-1. GENERAL.

23-2. Adapter, Keyer Group MX-1394/ARC-21 serves as the connecting link and control between Radio Set AN/ARC-21 and Emergency Keyer AN/ARA-26. Operation is such that by lifting the red cover on the emergency keyer control panel and placing the switch to the "ON" position, the Radio Set AN/ARC-21 will tune up and transmit coded signals, by continuous wave, until either being turned off or power failure stops the equipment. The operating frequency is factory set at 8364 kilocycles but can be changed to any frequency within the operating range of Radio Set AN/ARC-21.

23-3. TROUBLE ANALYSIS.

23-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

23-5. A defective unit should first be examined carefully for loose or broken parts. Rotary solenoid and rotary switch contacts that are dirty or discolored should be cleaned with carbon tetrachloride applied with a small brush.

23-6. With the Adapter, Keyer Group MX-1394/ARC-21 disconnected and using Multimeter TS-352/U, perform the following circuit checks:

a. Using table XCV, check the resistance from pins of connecting jack J3001 to ground.

b. Circuit check the wiring using the schematic diagram, figure 23-2, as a guide.

c. Check the d-c resistance of coil windings of ratchet motor B3001 and relay K3001, B3001 = 7.75 ohms and K3001 = 365 ohms.

23-7. CIRCUIT ANALYSIS.

23-8. The main components are a ratchet motor driven switch (B3001 and S3001), frequency bridge resistors R3001, R3002, R3003, and R3004, a relay K3001 and connecting jack J3001. To follow the theory of operation see the schematic diagram figure 23-2. Ground is applied to pin L of jack J3001 energizing ratchet motor B3001 through switch S3001D rear. Switch S3001D, rear, interrupts the solenoid current for continuous stepping action until switch S3001C, rear, opens the circuit. Switches S3001A, front, and S3001B, front, open the frequency bridge resistor circuits from the radio set control and substitute frequency bridge resistors R3001, R3002, R3003 and R3004 in the

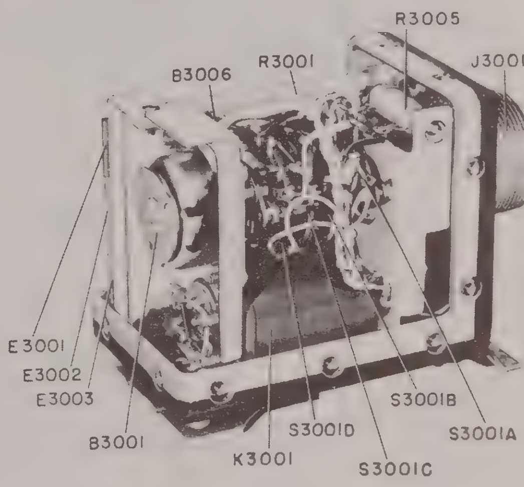


Figure 23-1. Adapter, Keyer Group MX-1394/ARC-21

TABLE XCV. RESISTANCE IN OHMS, FROM JACK, J3001, PINS TO GROUND

Pin	A	B	C	D	E	F	G	H
Normal	*	*	*	*	0	*	*	*
Keyer	30	0	*	*	0	29	88	101
Pin	J	K	L	M	N	P	Q	R
Normal	*	*	*	*	365	*	*	*
Keyer	30	*	*	*	365	31	*	*
Pin	S	T	U	V	W	X	Y	Z
Normal	*	*	*	*	*	*	*	*
Keyer	*	*	*	*	*	*	*	*

* Infinite resistance value.

WIRE TABLE	
WIRE NOS INCLUSIVE	DESCRIPTION COLOR AND CONDUCTOR
1	WIRE WHT BLK BRN TR 7/008
11-12	BLK RED
21	BLK GRN
31	BRN RED
41	BRN GRN
51	BRN BLU
61	RED/BLK
71	RED GRN
81	RED BLU
91	YEL/BLK
101	YEL RED
111	YEL/GRN
121	GRN/BLK
131-132	GRN BRN
141	GRN RED
151	BLU BRN
161	WHT BLU BLK TR
171	BLK
181	BRN
191	RED
201	ORN
211-213	WIRE WHT BLK TR 7/008

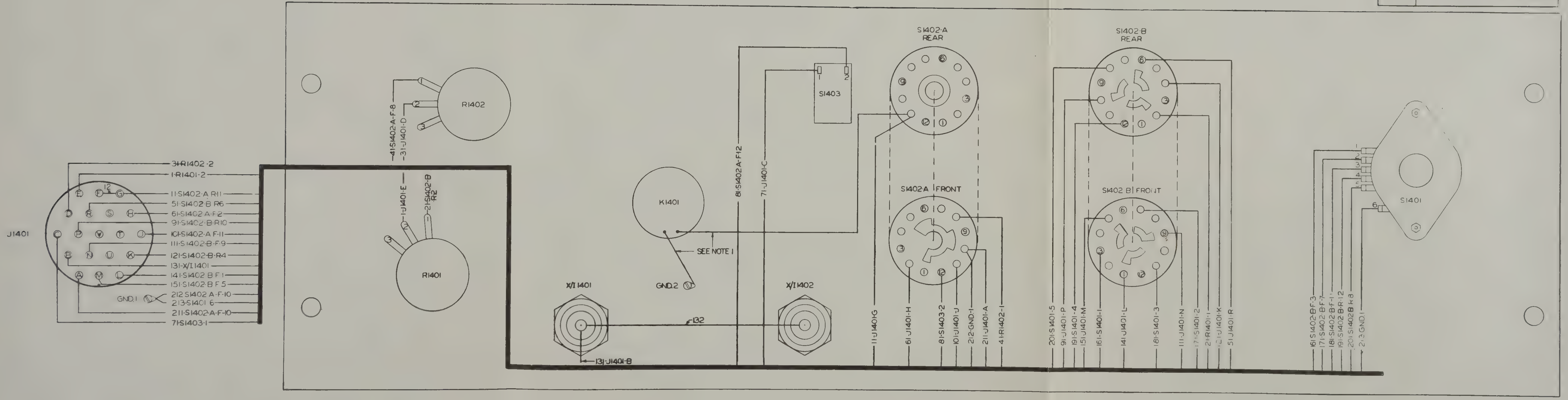

J1401
31-R1402-2
1-R1401-2
11-S1402-A R11
51-S1402-B R6
61-S1402 A-F-2
91-S1402-B-R10
101-S1402-A F-11
111-S1402-B-F-9
121-S1402-B-R4
131-X/I1401
141-S1402 B F1
151-S1402-B F5
212 S1402 A-F-10
213-S1401 6
211-S1402-A-F-10
71-S1403-1
GND.1
12
R1402
41-S1402-A-F-8
31-J1401-D
R1401
1-J1401-E
21-S1402-B R2
K1401
SEE NOTE 1
GND.2
X/I1401
X/I1402
132
131-J1401-B
S1403
81-S1402-A-F12
71-J1401-C
S1402-A REAR
S1402-A FRONT
11-J1401-G
61-J1401-H
81-S1403-2
101-J1401-J
212-GND-1
211-J1401-A
41-R1402-1
S1402-B REAR
S1402-B FRONT
201-S1401-5
91-J1401-P
191-S1401-4
151-J1401-M
161-S1401-1
141-J1401-L
181-S1401-3
111-J1401-N
171-S1401-2
21-R1401-1
121-J1401-K
51-J1401-R
S1401
161-S1402-B-F-3
171-S1402-B-F-7
181-S1402-B-F-11
191-S1402-B-R-12
201-S1402-B-R-8
213-GND-1

Figure 22-3. Radio Set Control C-455/ARC, Wiring Diagram

SECTION XXIII

MAINTENANCE INSTRUCTIONS FOR ADAPTER KEYER GROUP CY-1279A/ARC

23-1. GENERAL.

23-2. Adapter, Keyer Group MX-1394/ARC-21 serves as the connecting link and control between Radio Set AN/ARC-21 and Emergency Keyer AN/ARA-26. Operation is such that by lifting the red cover on the emergency keyer control panel and placing the switch to the "ON" position, the Radio Set AN/ARC-21 will tune up and transmit coded signals, by continuous wave, until either being turned off or power failure stops the equipment. The operating frequency is factory set at 8364 kilocycles but can be changed to any frequency within the operating range of Radio Set AN/ARC-21.

23-3. TROUBLE ANALYSIS.

23-4. The following trouble analysis is based on the assumption that the fault has been definitely localized to this particular chassis (or unit) by previous substitution in a working system or by other means.

23-5. A defective unit should first be examined carefully for loose or broken parts. Rotary solenoid and rotary switch contacts that are dirty or discolored should be cleaned with carbon tetrachloride applied with a small brush.

23-6. With the Adapter, Keyer Group MX-1394/ARC-21 disconnected and using Multimeter TS-352/U, perform the following circuit checks:

a. Using table XCV, check the resistance from pins of connecting jack J3001 to ground.

b. Circuit check the wiring using the schematic diagram, figure 23-2, as a guide.

c. Check the d-c resistance of coil windings of ratchet motor B3001 and relay K3001, B3001 = 7.75 ohms and K3001 = 365 ohms.

23-7. CIRCUIT ANALYSIS.

23-8. The main components are a ratchet motor driven switch (B3001 and S3001), frequency bridge resistors R3001, R3002, R3003, and R3004, a relay K3001 and connecting jack J3001. To follow the theory of operation see the schematic diagram figure 23-2. Ground is applied to pin L of jack J3001 energizing ratchet motor B3001 through switch S3001D rear. Switch S3001D, rear, interrupts the solenoid current for continuous stepping action until switch S3001C, rear, opens the circuit. Switches S3001A, front, and S3001B, front, open the frequency bridge resistor circuits from the radio set control and substitute frequency bridge resistors R3001, R3002, R3003 and R3004 in the

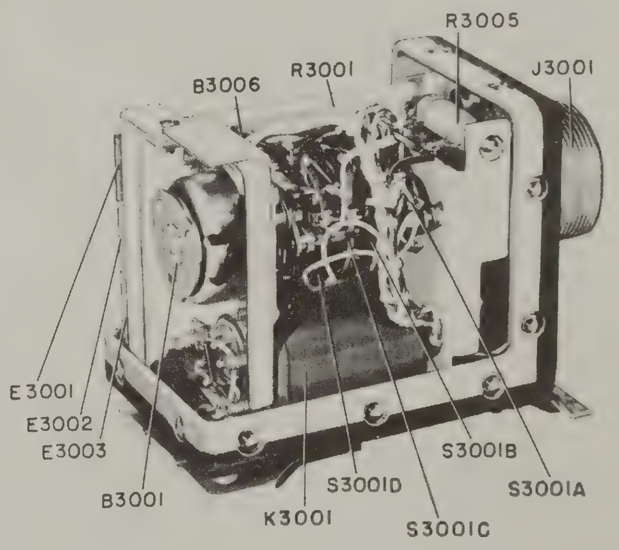


Figure 23-1. Adapter, Keyer Group MX-1394/ARC-21

TABLE XCV. RESISTANCE IN OHMS, FROM JACK, J3001, PINS TO GROUND

Pin	A	B	C	D	E	F	G	H
Normal	*	*	*	*	0	*	*	*
Keyer	30	0	*	*	0	29	88	101
Pin	J	K	L	M	N	P	Q	R
Normal	*	*	*	*	365	*	*	*
Keyer	30	*	*	*	365	31	*	*
Pin	S	T	U	V	W	X	Y	Z
Normal	*	*	*	*	*	*	*	*
Keyer	*	*	*	*	*	*	*	*

* Infinite resistance value.

Keyer Group Adapter MX-1394/ARC-21. Switch S3001C, front, removes the bridge supply voltage from the radio set control and connects it to the frequency bridge resistors R3001, R3002, R3003, and R3004.

23-9. Contacts 4 and 5 of switch S3001B, rear, ground the take control circuit, tripping any other station which may have control. In addition, contacts 10 and 11 apply 27.5 volts to the start cycle circuit, initiating the tuning of the receiver-transmitter to the emergency frequency. The start cycle circuit of the radio set control is opened by a relay in Keyer KY-65/ARA-26. Switch S3001A, rear, removes the transmitting key from circuit and substitutes a temporary ground so the transmitter will tune immediately on completion of receiver tuning. On completion of the transmitter tuning cycle, relay K3001 is energized from the modulator lock-out circuit. Contacts 6 and 7 open, removing the temporary keying ground and contacts 2 and 3 close to energize the keyer motor providing the coded keying for the transmitter. High power operation is assured by a relay in the keyer which opens the "HI-LOW" power control circuit. Resistor R3005 and capacitor C3001 are used for spark suppression at contacts of switch S3001D, rear. Resistor R3006 drops the voltage to the bridge resistors, R3001, R3002, R3003, and R3004 for operation of the bridge balance system.

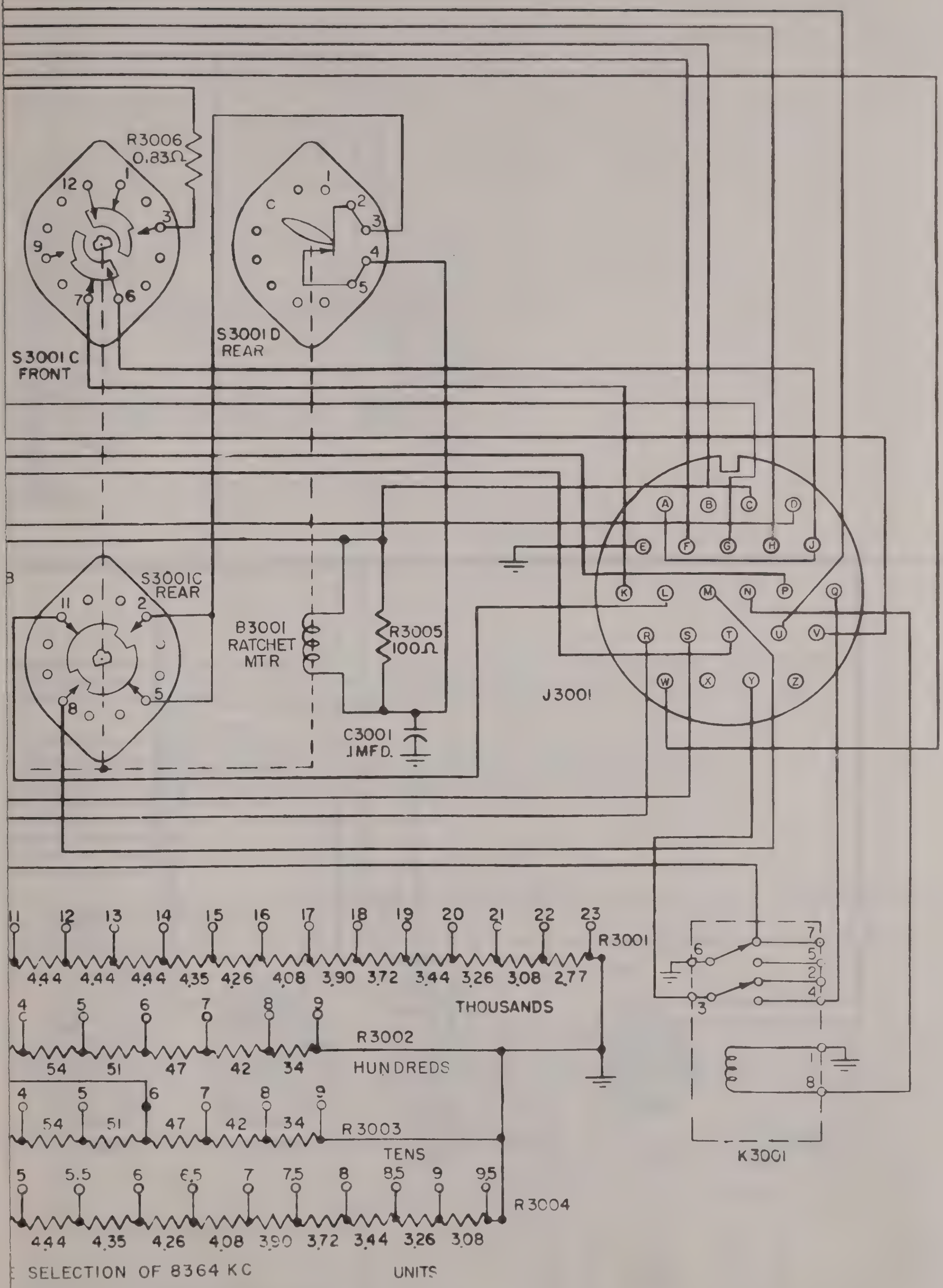
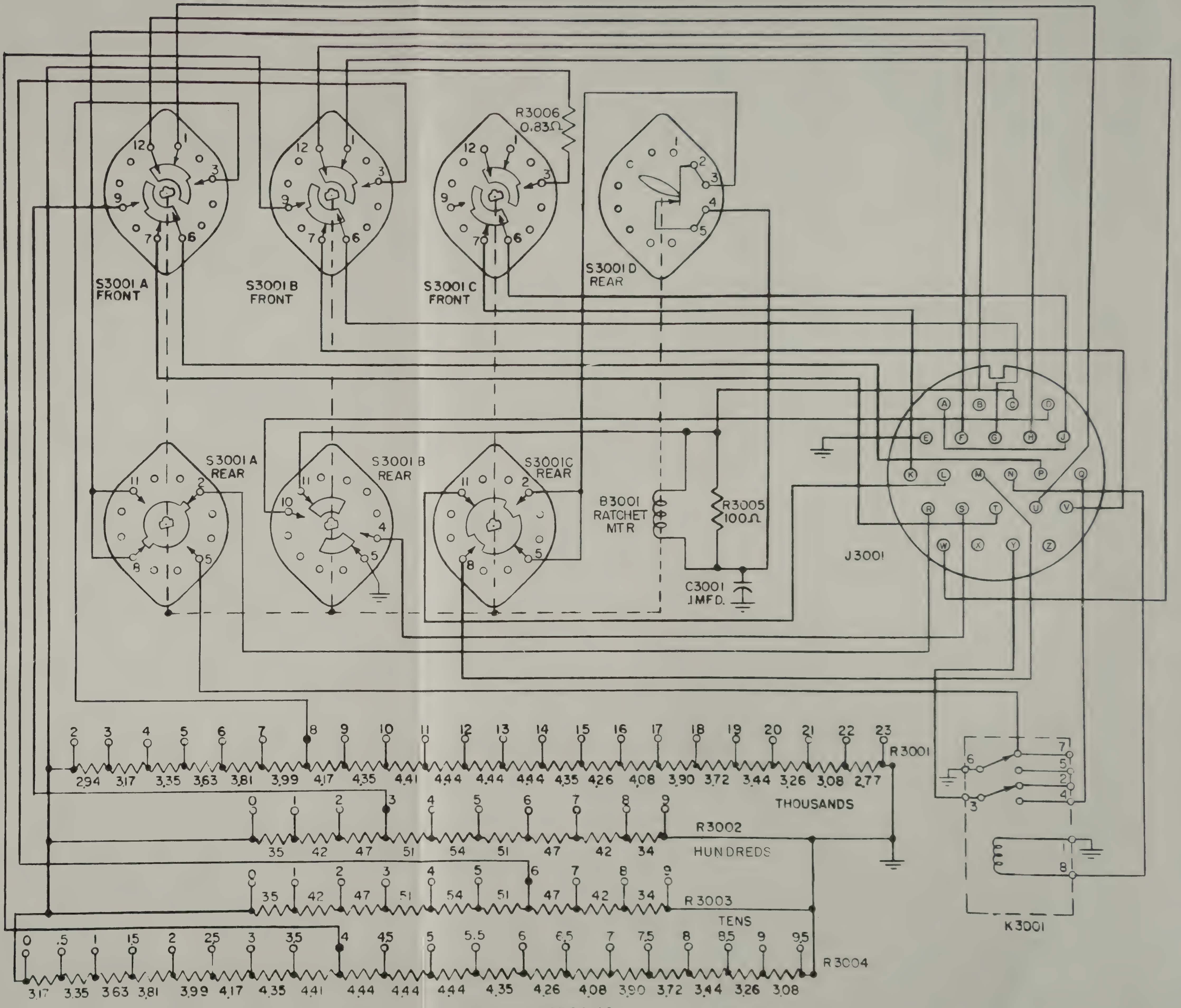

R3006
0.33Ω
S3001 C
FRONT
S3001 D
REAR
S3001C
REAR
B3001
RATCHET
MTR
R3005
100Ω
C3001
.1MFD.
J3001
A B C D E F G H J K L M N P Q R S T U V W X Y Z
R3001
11 12 13 14 15 16 17 18 19 20 21 22 23
4.44 4.44 4.44 4.35 4.26 4.08 3.90 3.72 3.44 3.26 3.08 2.77
THOUSANDS
R3002
4 5 6 7 8 9
54 51 47 42 34
HUNDREDS
R3003
4 5 6 7 8 9
54 51 47 42 34
TENS
R3004
5 5.5 6 6.5 7 7.5 8 8.5 9 9.5
4.44 4.35 4.26 4.08 3.90 3.72 3.44 3.26 3.08
SELECTION OF 8364 KC
UNITS
K3001

Figure 23-2. Adapter, Keyer Group MX-1394/ARC-21, Schematic Diagram

Keyer Group Adapter MX-1394/ARC-21. Switch S3001C, front, removes the bridge supply voltage from the radio set control and connects it to the frequency bridge resistors R3001, R3002, R3003, and R3004.

23-9. Contacts 4 and 5 of switch S3001B, rear, ground the take control circuit, tripping any other station which may have control. In addition, contacts 10 and 11 apply 27.5 volts to the start cycle circuit, initiating the tuning of the receiver-transmitter to the emergency frequency. The start cycle circuit of the radio set control is opened by a relay in Keyer KY-65/ARA-26. Switch S3001A, rear, removes the transmitting key from circuit and substitutes a temporary ground so the transmitter will tune immediately on completion of receiver tuning. On completion of the transmitter tuning cycle, relay K3001 is energized from the modulator lock-out circuit. Contacts 6 and 7 open, removing the temporary keying ground and contacts 2 and 3 close to energize the keyer motor providing the coded keying for the transmitter. High power operation is assured by a relay in the keyer which opens the "HI-LOW" power control circuit. Resistor R3005 and capacitor C3001 are used for spark suppression at contacts of switch S3001D, rear. Resistor R3006 drops the voltage to the bridge resistors, R3001, R3002, R3003, and R3004 for operation of the bridge balance system.


R3006
0.83Ω
S3001 A
FRONT
S3001 B
FRONT
S3001 C
FRONT
S3001 D
REAR
S3001 A
REAR
S3001 B
REAR
S3001C
REAR
B3001
RATCHET
MTR
R3005
100Ω
C3001
.1MFD.
J3001
A B C D E F G H J K L M N P Q R S T U V W X Y Z
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
R3001
2.94 3.17 3.35 3.63 3.81 3.99 4.17 4.35 4.41 4.44 4.44 4.44 4.35 4.26 4.08 3.90 3.72 3.44 3.26 3.08 2.77
THOUSANDS
0 1 2 3 4 5 6 7 8 9
R3002
35 42 47 51 54 51 47 42 34
HUNDREDS
0 1 2 3 4 5 6 7 8 9
35 42 47 51 54 51 47 42 34
R3003
TENS
0 .5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5
R3004
3.17 3.35 3.63 3.81 3.99 4.17 4.35 4.41 4.44 4.44 4.44 4.35 4.26 4.08 3.90 3.72 3.44 3.26 3.08
UNITS
K3001

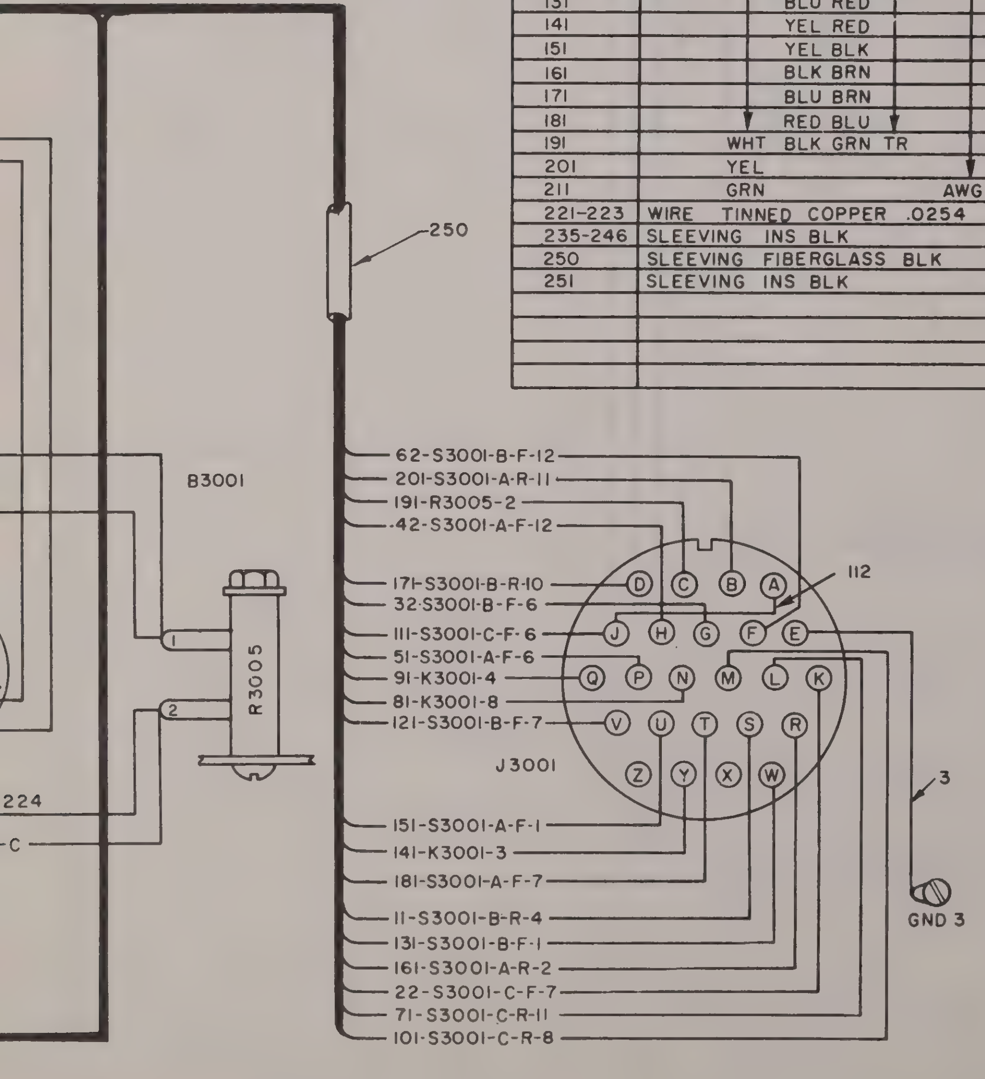
FREQ BRIDGES INDICATE SELECTION OF 8364 KC

NOTE:

1 ALL SWITCHES VIEWED FROM SHAFT END

Figure 23-2. Adapter, Keyer Group MX-1394/ARC-21, Schematic Diagram

WIRE TABLE				
WIRE NO. (INCLUSIVE)	DESCRIPTION			
	COLOR AND CONDUCTOR			
1-3	WHT BLK	TR	AWG24	600V
11	WHT			
21-22	BLU			
31-32	RED			
41-42	BRN			
51-52	YEL			
61-62	GRN			
71	ORN			
81	BRN RED			
91	GRN BLK			
101	YEL GRN			
111-112	BLU BLK			
121	GRN RED			
131	BLU RED			
141	YEL RED			
151	YEL BLK			
161	BLK BRN			
171	BLU BRN			
181	RED BLU			
191	WHT BLK GRN TR			
201	YEL			
211	GRN		AWG24	600V
221-223	WIRE TINNED COPPER .0254 DIA.			
235-246	SLEEVING INS BLK			
250	SLEEVING FIBERGLASS BLK			
251	SLEEVING INS BLK			


250
B3001
R3005
1
2
224
-C
62-S3001-B-F-12
201-S3001-A-R-11
191-R3005-2
42-S3001-A-F-12
171-S3001-B-R-10
32-S3001-B-F-6
111-S3001-C-F-6
51-S3001-A-F-6
91-K3001-4
81-K3001-8
121-S3001-B-F-7
J3001
151-S3001-A-F-1
141-K3001-3
181-S3001-A-F-7
11-S3001-B-R-4
131-S3001-B-F-1
161-S3001-A-R-2
22-S3001-C-F-7
71-S3001-C-R-11
101-S3001-C-R-8
D C B A
J H G F E
Q P N M L K
V U T S R
Z Y X W
112
3
GND 3

SECTION XXIV

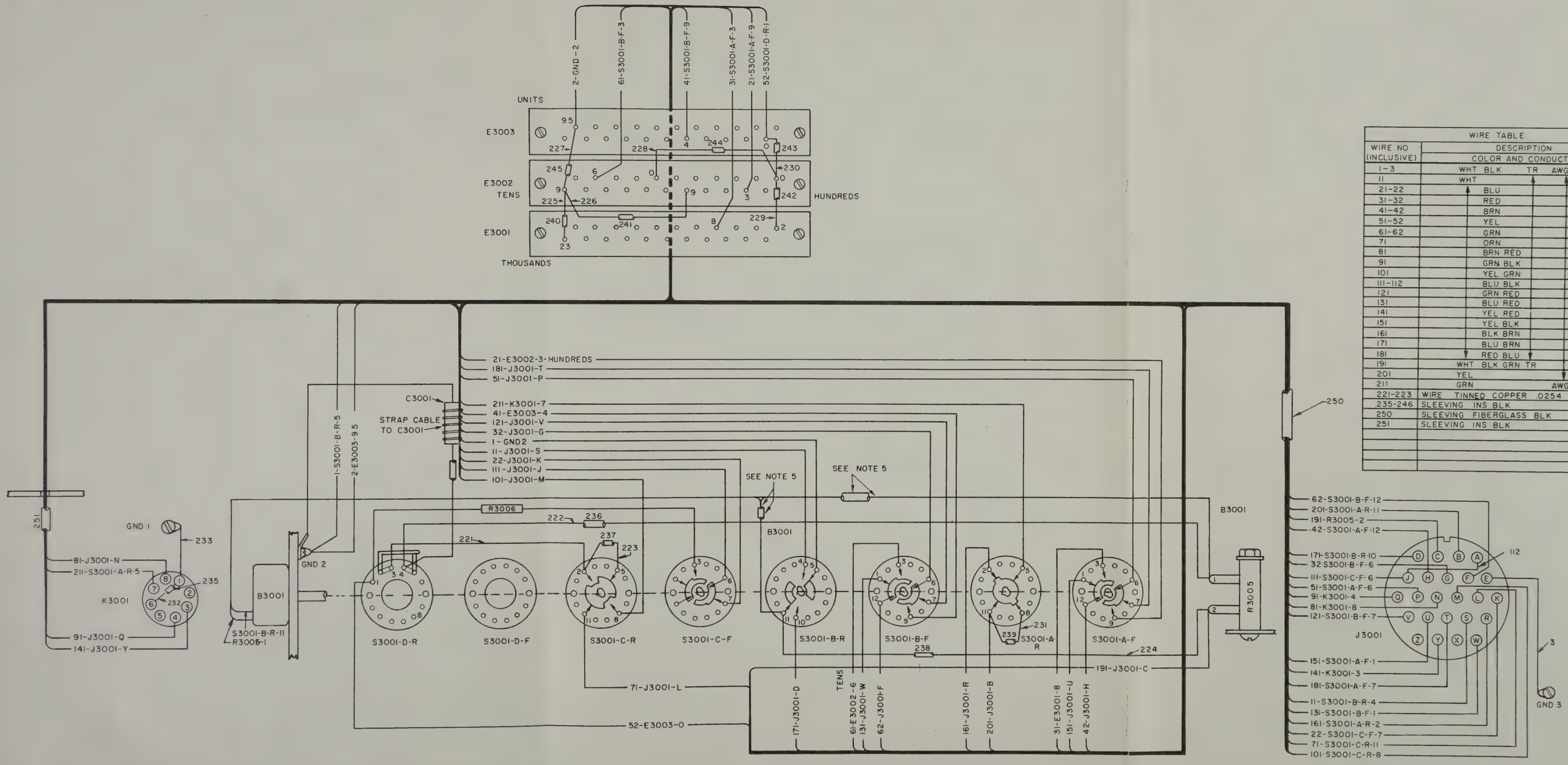
DIFFERENCE DATA SHEETS

INDEX

Component Nomenclature	Applicable Contract	Page
M1 Amplifier, Radio Frequency AM-774/ARC-21	AF33(600) 32926 and up	234
M4 Amplifier-Filter Assembly, AM-775A/ARC-21	AF33(600) 32926 and up	239

This section describes components of Radio Set AN/ARC-21 procured under subsequent contracts which differ from those procured under contract AF33(600) 32231.

The applicable Maintenance Instructions section and the basic data contained in Sections I through VI apply except for the specific differences noted in the applicable Difference Data Sheet.


2-GND-2
61-S3001-B-F-3
41-S3001-B-F-9
31-S3001-A-F-3
21-S3001-A-F-9
52-S3001-D-R-1
UNITS
E3003
E3002
TENS
E3001
THOUSANDS
HUNDREDS
95
227
228
4
244
243
245
6
230
9
225
226
3
242
240
241
8
229
2
23
21-E3002-3-HUNDREDS
181-J3001-T
51-J3001-P
C3001
STRAP CABLE TO C3001
211-K3001-7
41-E3003-4
121-J3001-V
32-J3001-G
1-GND2
11-J3001-S
22-J3001-K
111-J3001-J
101-J3001-M
1-S3001-B-R-5
2-E3003-9.5
SEE NOTE 5
SEE NOTE 5
B3001
R3006
222
236
237
221
223
251
GND 1
233
81-J3001-N
211-S3001-A-R-5
235
K3001
232
91-J3001-Q
141-J3001-Y
GND 2
B3001
S3001-B-R-11
R3005-1
S3001-D-R
S3001-D-F
S3001-C-R
S3001-C-F
S3001-B-R
S3001-B-F
S3001-A-R
S3001-A-F
231
239
238
224
191-J3001-C
71-J3001-L
52-E3003-0
171-J3001-D
TENS
61-E3002-6
131-J3001-W
62-J3001-F
161-J3001-R
201-J3001-B
31-E3001-8
151-J3001-U
42-J3001-H
250
B3001
R3005
62-S3001-B-F-12
201-S3001-A-R-11
191-R3005-2
42-S3001-A-F-12
171-S3001-B-R-10
32-S3001-B-F-6
111-S3001-C-F-6
51-S3001-A-F-6
91-K3001-4
81-K3001-8
121-S3001-B-F-7
112
J3001
151-S3001-A-F-1
141-K3001-3
181-S3001-A-F-7
11-S3001-B-R-4
131-S3001-B-F-1
161-S3001-A-R-2
22-S3001-C-F-7
71-S3001-C-R-11
101-S3001-C-R-8
3
GND 3

WIRE TABLE	
WIRE NO (INCLUSIVE)	DESCRIPTION
	COLOR AND CONDUCTOR
1-3	WHT BLK TR AWG24 600V
11	WHT
21-22	BLU
31-32	RED
41-42	BRN
51-52	YEL
61-62	GRN
71	ORN
81	BRN RED
91	GRN BLK
101	YEL GRN
111-112	BLU BLK
121	GRN RED
131	BLU RED
141	YEL RED
151	YEL BLK
161	BLK BRN
171	BLU BRN
181	RED BLU
191	WHT BLK GRN TR
201	YEL
211	GRN AWG24 600V
221-223	WIRE TINNED COPPER .0254 DIA.
235-246	SLEEVING INS BLK
250	SLEEVING FIBERGLASS BLK
251	SLEEVING INS BLK

Figure 23-3. Adapter, Keyer Group MX-1394/ARC-21, Connection Diagram

SECTION XXIV

DIFFERENCE DATA SHEETS

INDEX

Component Nomenclature	Applicable Contract	Page
M1 Amplifier, Radio Frequency AM-774/ARC-21	AF33(600) 32926 and up	234
M4 Amplifier-Filter Assembly, AM-775A/ARC-21	AF33(600) 32926 and up	239

This section describes components of Radio Set AN/ARC-21 procured under subsequent contracts which differ from those procured under contract AF33(600) 32231.

The applicable Maintenance Instructions section and the basic data contained in Sections I through VI apply except for the specific differences noted in the applicable Difference Data Sheet.

M1 AMPLIFIER RADIO FREQUENCY AM-774A/ARC-21 CONTRACT NO. AF33(600)32926 and Up

THE INSTRUCTIONS CONTAINED IN PRECEDING SECTIONS OF THIS HANDBOOK APPLY, EXCEPT FOR THE DIFFERENCES LISTED IN THIS DATA SHEET.

CHARACTERISTIC DIFFERENCES. M1 Amplifier Radio Frequency AM-774A/ARC-21, procured under Contract AF33(600)32926, differs as follows from earlier models.

a. A vacuum capacitor C430, replaces the oil capacitor C430 previously used.

b. Clutch O405 is eliminated.

c. A relay K412, and a limit switch S412, have been added to the circuit of motor B403.

d. The designation M1 forms a part of the nomenclature and is stamped on the chassis near the nameplate.

THEORY OF OPERATION. Same as Amplifier, Radio Frequency AM-774A/ARC except as follows: (See figure 24-3.)

a. Homing. Relay K303 now energizes relay K412, applying power to motor B403 which then drives loading capacitor C430 at full speed towards home. If the frequency is below 5 megacycles, switch S412 is open, thereby connecting 80-ohm resistor R431 in series with motor B403, causing the motor to operate at a slower speed. When the capacitor reaches home, relay K412 de-energizes, shorting the armature of motor B403. The motor then acts as a magnetic

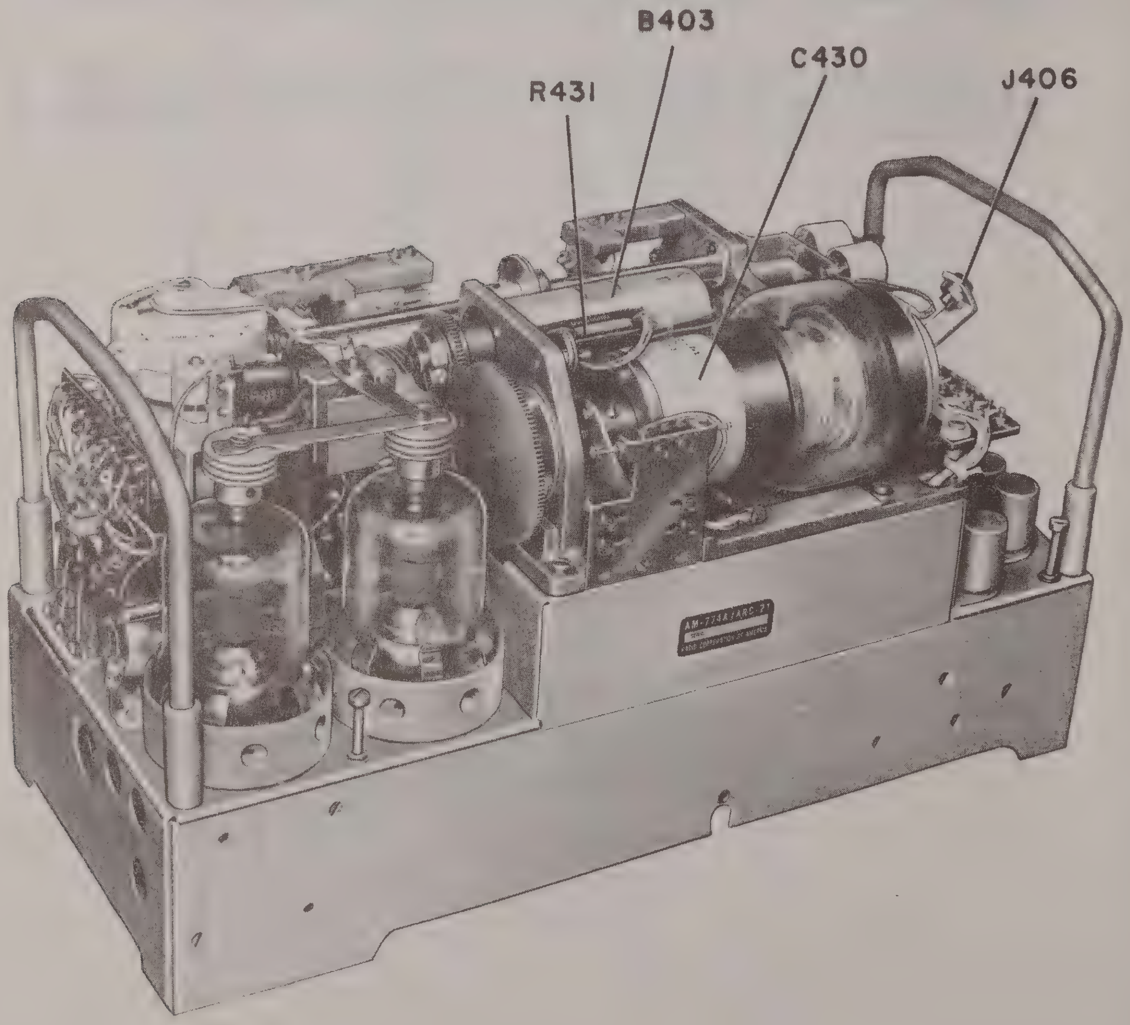


Figure 24-1. M1 Amplifier, Radio Frequency AM-774A/ARC-21, Left Side

TABLE XCVI. RESISTANCE FROM PINS OF PLUGS P401 AND P402 AND GROUND

Pin	A	B	C	D	E	F	H	J	K	L
P401	0.4	**	**	31000	**	500	**	0	**	**
P402	3.5	0	**	**	0	**	0	0	**	500
Pin	M	N	P	R	S	T	U	V	W	X
P401	0	0	1050	50K	0	**	75	**	**	**
P402	**	**	550	**	0	**	*2 meg	**	500	0
Pin	Y	Z	AA	BB	CC	DD	EE	FF	HH	
P401	**	**	**	**	**	**	**	**	**	
P402	**	**	**	**	**	**	41	**	**	
Pin	JJ	KK	LL	MM						
P401	**	**	**	**						
P402	**	**	**	**						

* Indicates increasing resistance due to capacitor charge.

** Infinite resistance value.

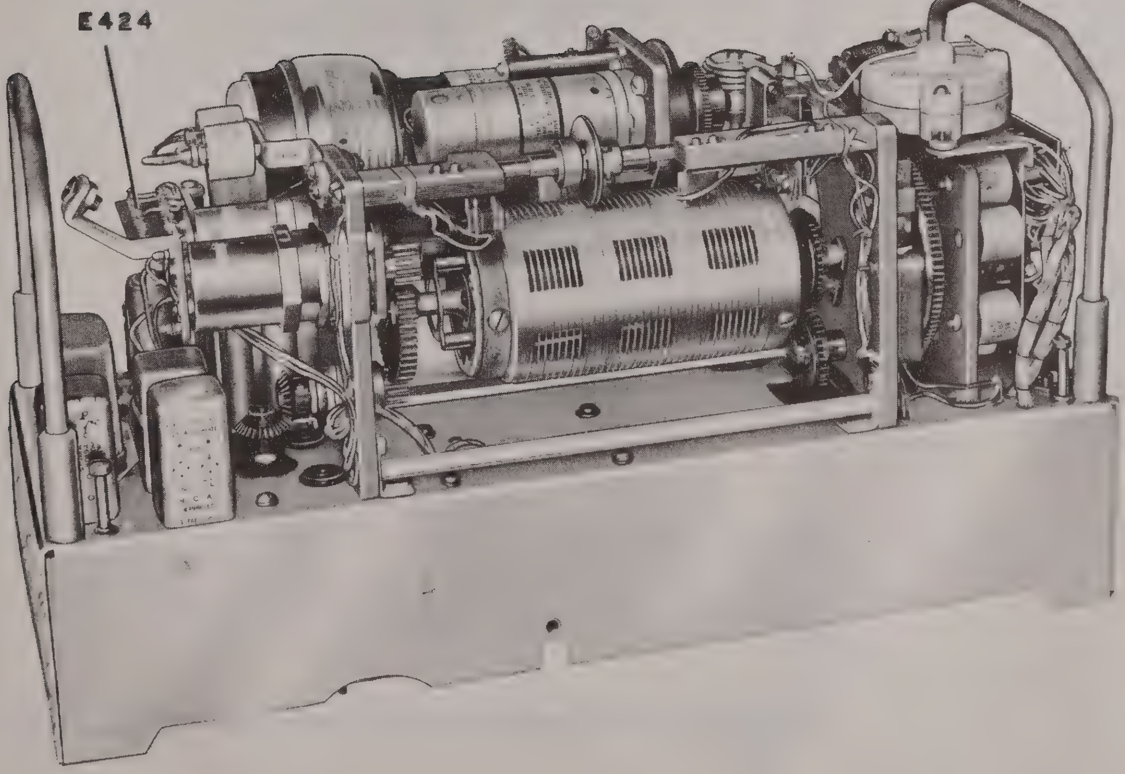


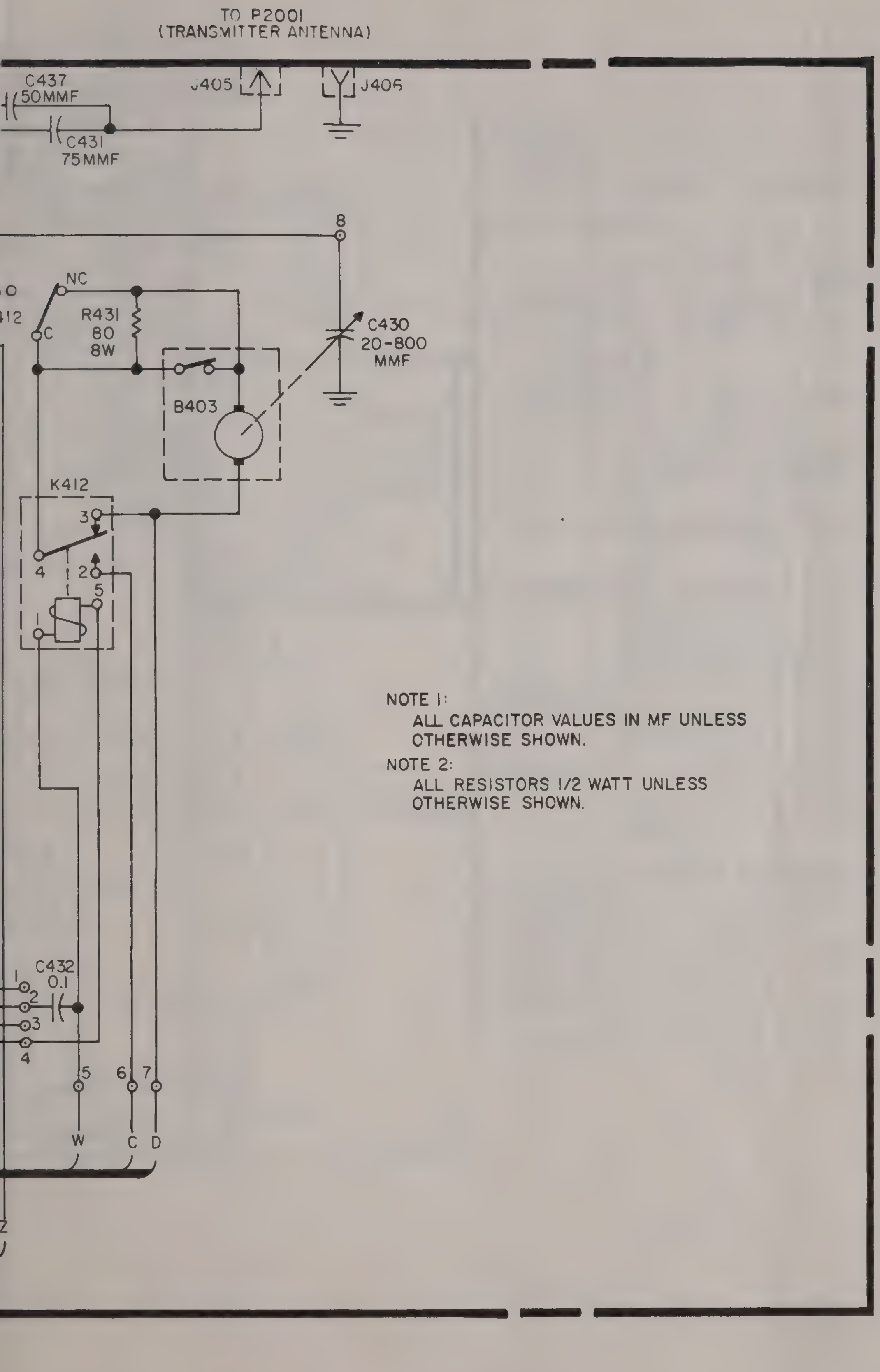
Figure 24-2. M1 Amplifier, Radio Frequency AM-774A/ARC-21, Right Side

brake to bring capacitor C430 quickly to a stop.

MAINTENANCE INSTRUCTIONS. Same as maintenance instructions for Amplifier, Radio Frequency AM-774A/ARC-21 except as follows:

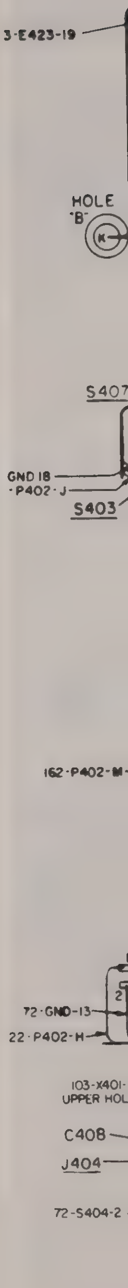
a. Refer to figures 24-1 and 24-2 for component locations and to schematic diagram, figure 24-3 and connection diagram, figure 24-4, for circuit information.

b. Resistance of P401 and P402 to Ground. See table XCVI.


TO P2001
(TRANSMITTER ANTENNA)
C437
50MMF
J405
J406
C431
75MMF
8
NC
R431
80
8W
C
C430
20-800
MMF
B403
K412
3
4
2
5
C432
0.1
1
2
3
4
5
6
7
W
C
D
Z

NOTE 1:
ALL CAPACITOR VALUES IN MF UNLESS OTHERWISE SHOWN.

NOTE 2:
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

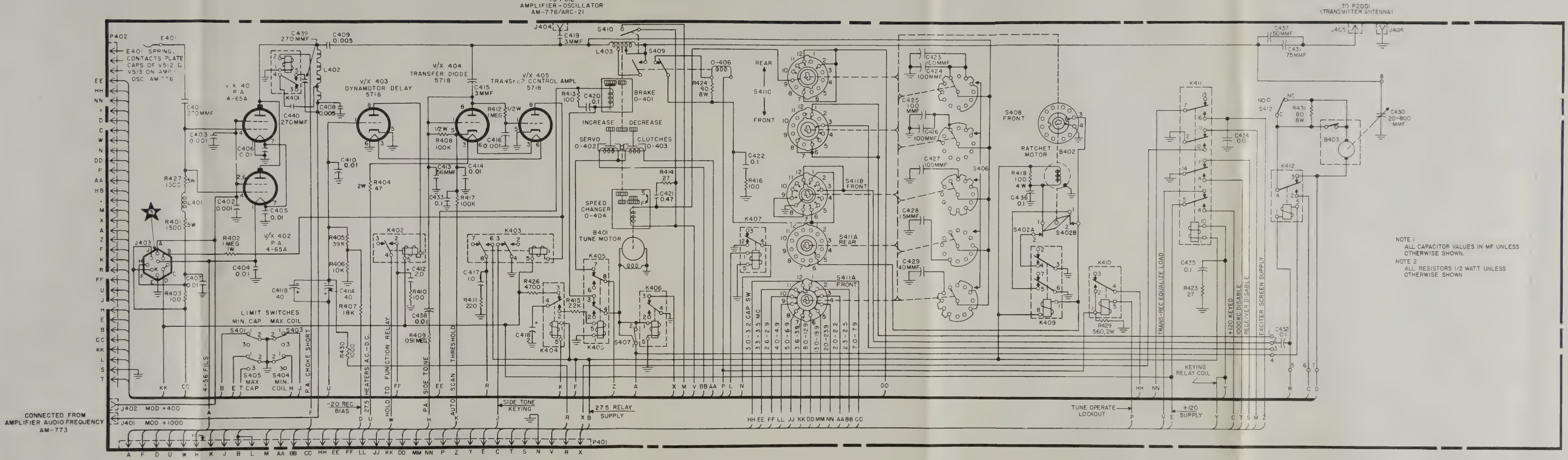

3-E423-19
HOLE
"B"
S407
GND 18
-P402-J
S403
162-P402-M
72-GND-13
22-P402-H
103-X401-
UPPER HOL
C408
J404
72-S404-2

-3. M1 Amplifier, Radio Frequency AM-774A/ARC-21, Schematic Diagram brake to bring capacitor C430 quickly to a stop.

MAINTENANCE INSTRUCTIONS. Same as maintenance instructions for Amplifier, Radio Frequency AM-774A/ARC-21 except as follows:

a. Refer to figures 24-1 and 24-2 for component locations and to schematic diagram, figure 24-3 and connection diagram, figure 24-4, for circuit information.

b. Resistance of P401 and P402 to Ground. See table XCVI.


TO P512
AMPLIFIER-OSCILLATOR
AM-776/ARC-21
TO P2001
(TRANSMITTER ANTENNA)
P402
E401
E401 SPRING, CONTACTS PLATE CAPS OF V512 & V513 ON AMP-OSC AM-776
V/X 401 P.A. 4-65A
V/X 402 P.A. 4-65A
V/X 403 DYNAMOTOR DELAY 5718
V/X 404 TRANSFER DIODE 5718
V/X 405 TRANSFER CONTROL AMPL 5718
C439 270MMF
C409 0.005
L402
L403
S410
S409
J404
C419 3MMF
O-406
BRAKE O-401
INCREASE
DECREASE
SERVO O-402
CLUTCHES O-403
SPEED CHANGER O-404
B401 TUNE MOTOR
REAR
S411C
FRONT
S411B FRONT
S411A REAR
S411A FRONT
S406
S408 FRONT
RATCHET MOTOR
B402
K401
K402
K403
K404
K405
K406
K407
K409
K410
K411
K412
B403
S402A
S402B
S407
S412
J403
J402 MOD +400
J401 MOD +1000
CONNECTED FROM AMPLIFIER AUDIO FREQUENCY AM-773
LIMIT SWITCHES
MIN. CAP. MAX COIL
S401
S403
S405 MAX CAP
S404 MIN. COIL
4-56 FILS
P.A. CHOKE SHORT
HEATERS A.C.-D.C.
HOLD TO FUNCTION RELAY
P.A. SIDE TONE
AUTO SCAN THRESHOLD
-20 REC BIAS
SIDE TONE KEYING
27.5 RELAY SUPPLY
CAP SW
3.0-3.2
3.3-3.5 MC
2.6-2.9
4.0-4.9
5.0-6.9
3.6-3.9
8.0-12.9
13.0-19.9
20-23.9
2.0-2.2
2.3-2.5
7.0-7.9
TRANS-REC EQUALIZE LOAD
+120 KEYED
1000 MC DISABLE
RECEIVER DISABLE
EXCITER SCREEN SUPPLY
KEYING RELAY COIL
TUNE OPERATE LOCKOUT
+120 SUPPLY
P401
C437 50MMF
C431 75MMF
C430 20-800 MMF
R431 80 8W
J405
J406
A F D U W H K J B L M AA BB CC HH EE FF LL JJ KK DD MM NN P Z Y E C T S N V R X

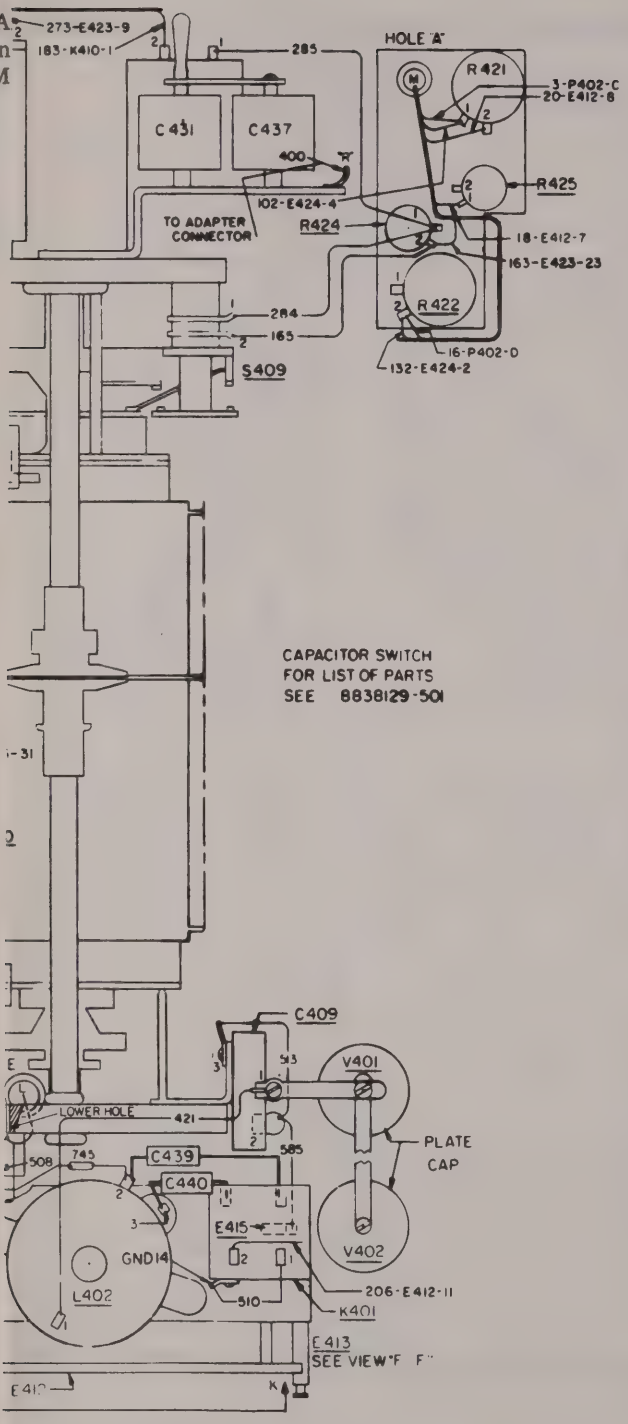
NOTE 1
ALL CAPACITOR VALUES IN MF UNLESS OTHERWISE SHOWN.
NOTE 2
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN

Figure 24-3. M1 Amplifier, Radio Frequency AM-774A/ARC-21, Schematic Diagram

Sec
Diff

bra

MA
nan
AM


273-E423-9
183-K410-1
2
2
1
285
HOLE "A"
R421
3-P402-C
20-E412-8
C431
C437
400
R425
102-E424-4
TO ADAPTER CONNECTOR
R424
18-E412-7
163-E423-23
R422
284
165
16-P402-D
132-E424-2
S409
C409
513
V401
LOWER HOLE
421
585
PLATE CAP
508
745
C439
C440
E415
GND14
L402
V402
206-E412-11
510
K401
E413
SEE VIEW "F F"
E412
K

CAPACITOR SWITCH
FOR LIST OF PARTS
SEE 8838129-501

WIRE TABLE			
WIRE NO. INCULSIVE	DESCRIPTION COLOR AND CONDUCTOR		
1-4	WIRE WHT-RED/BLU TR.	AWG 20	600V
11-21	RED TR.	AWG 20	
71-74	BLK	AWG 24	
81-82	BRN		
91-94	RED		
101-106	ORN		
111-117	YEL		
121-123	GRN		
131-134	BLU TR		
141-143	BLK/BRN TR		
151-154	BLK/RED		
161-165	BLK/GRN		
171-172	BRN/RED		
181-184	BRN/GRN		
191-195	BRN/BLU		
201-206	RED/BLK		
211-215	RED/GRN		
221-224	RED/BLU		
231-233	YEL/BLK		
241-243	YEL/GRN		
251-253	YEL/RED		
261-266	GRN/BLK		
271-273	GRN/BRN		
281-285	GRN/RED		
291-294	BLU/BRN		
301-302	WHT BLU/BLK TR.		
311-314	RED		
321-323	GREEN		
331-333	YELLOW		
341-345	BLUE	AWG 24	
361	WHT-BLU TR.	AWG 18	
371-372	WHT-BRN TR.	AWG 18	
391-392	WIRE WHT-GRN TR	AWG 18	600V
400	CONNECTOR LINK		
421	WIRE WHT-ORN	AWG 20	600V
441	CABLE SHIELDED WHT	AWG 24	600V
452-475	WIRE TINNED COPPER	.0159 DIA.	
501-545	WIRE TINNED COPPER	.0320 DIA.	
581-585	WIRE TINNED COPPER	.0402 DIA	
702-713	SLEEVING INSUL BLK	.022 ID	
820	SLEEVING INSUL BLK	.085 ID	
830	SLEEVING INSUL BLK	.133 ID	
731-752	SLEEVING INSUL BLK	.042 ID	
760	SLEEVING INSUL TRANS	.166 ID	
812	SLEEVING INSUL BLK	.076 ID	

NOTES:

1. E401 (SPRING) CONTACTS PLATE CAPS OF V512 & V513 ON PERM. TUNER CHASSIS.
2. DRAWING CONTAINS INFORMATION FOR USE WITH VACUUM CAPACITOR ASSEMBLY 360209-501. FOR UNITS USING OIL CAPACITOR ASSEMBLY 8838312-501 (SEE DETAIL "A"). THE FOLLOWING WIRING CHANGES ARE TO BE MADE:

CONNECT WIRE	BETWEEN	
195	E412-9 & E423-3	
524 & 735	E423-2 & E423-29	
503 & 741	R421-2 & R425-2	SEE NOTE 3
502 & 740	R422-1 & R425-1	
400	C431-C437 & E421	SEE DETAIL "A"
192	P402-T & S408-2	
343	E423-3 & E416-1	
123	E423-32 & E416-2	
19	P402-B & E416-3	
112	P402-E & E416-4	
102	R425-1 & E416-5	
132	R422-2 & E416-6	
REMOVE ½" FROM WIRE #400		

3. WIRES 502, 503, 740 & 741 ARE ISSUED ON 8902513-501 ONLY (P.A. WITH OIL CAPACITOR)

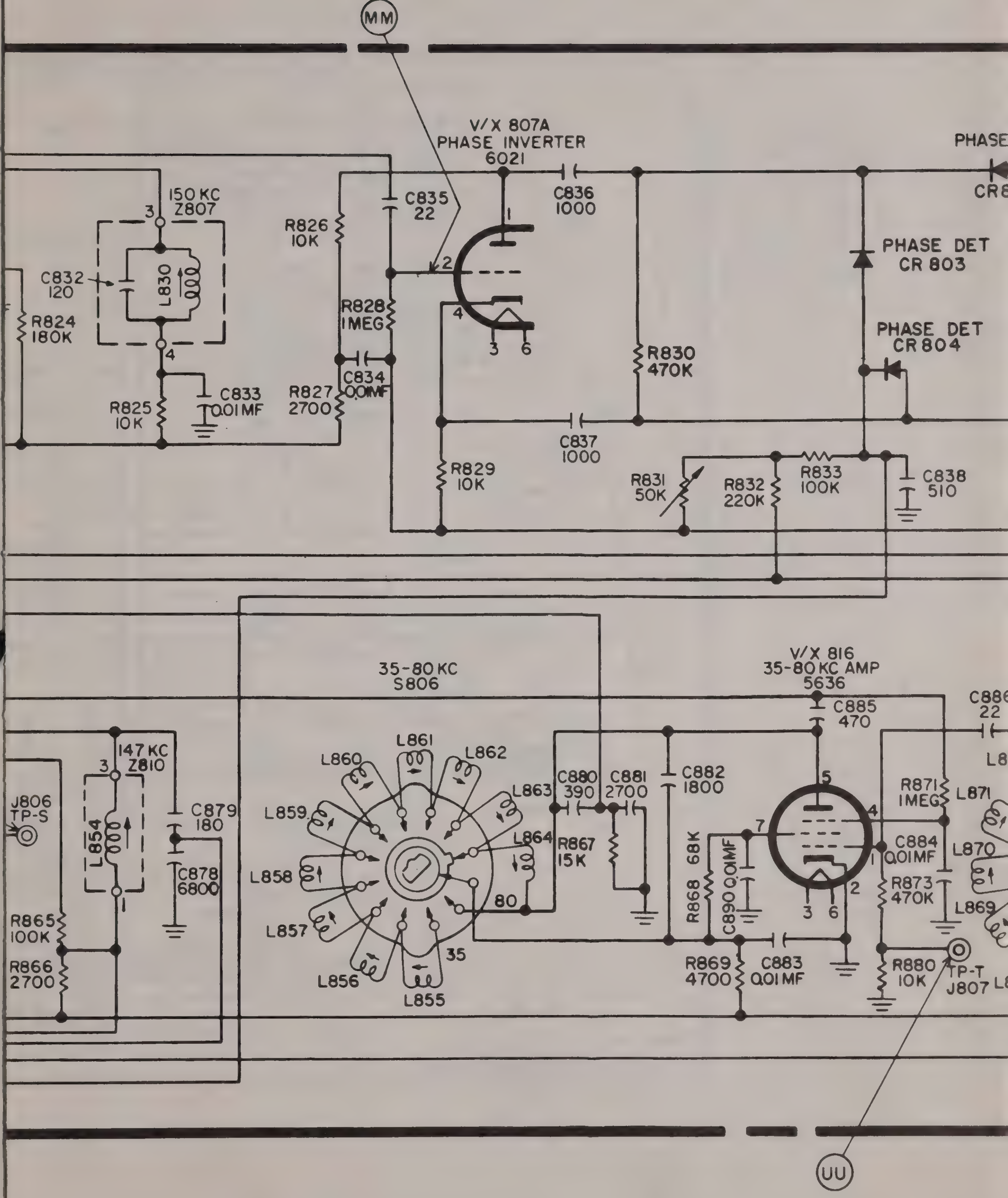

MM
V/X 807A
PHASE INVERTER
6021
PHASE
CR8
150 KC
Z807
3
C832
120
L830
R824
180K
4
R825
10K
C833
0.01 MF
R826
10K
C835
22
R828
1MEG
C834
0.01MF
R827
2700
1
2
4
3
6
C836
1000
R830
470K
C837
1000
R829
10K
PHASE DET
CR 803
PHASE DET
CR 804
R831
50K
R832
220K
R833
100K
C838
510
35-80 KC
S806
147 KC
Z810
3
L854
1
J806
TP-S
C879
180
C878
6800
R865
100K
R866
2700
L855
L856
L857
L858
L859
L860
L861
L862
L863
L864
80
35
C880
390
C881
2700
R867
15K
C882
1800
V/X 816
35-80 KC AMP
5636
C885
470
C886
22
L8
5
7
4
1
2
3
6
R868 68K
C890 0.01MF
C883
0.01 MF
R869
4700
R871
1MEG
L871
C884
0.01MF
L870
R873
470K
L869
R880
10K
TP-T
J807
L8
UU

Figure 24-5. M1 Amplifier-F

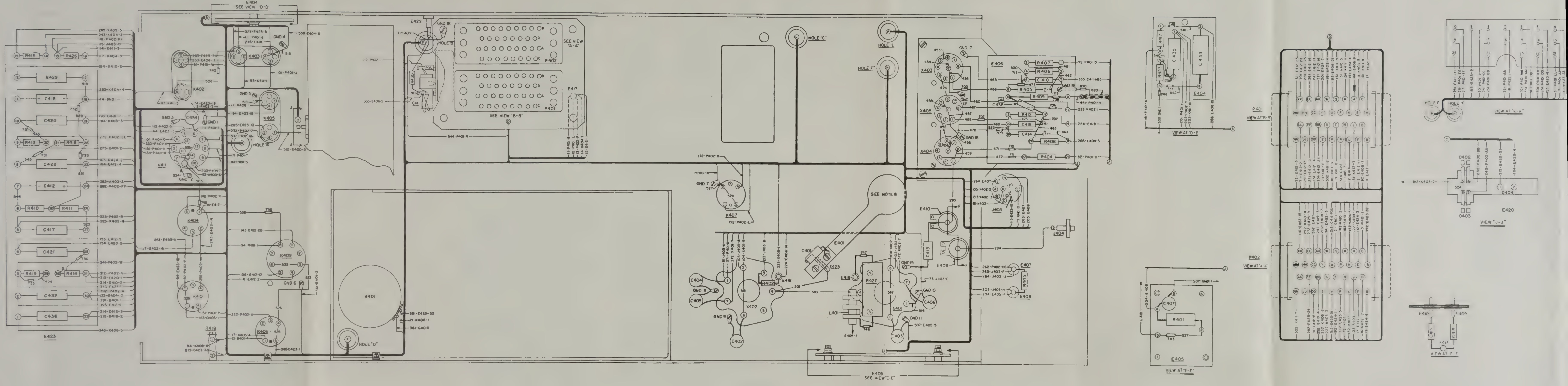
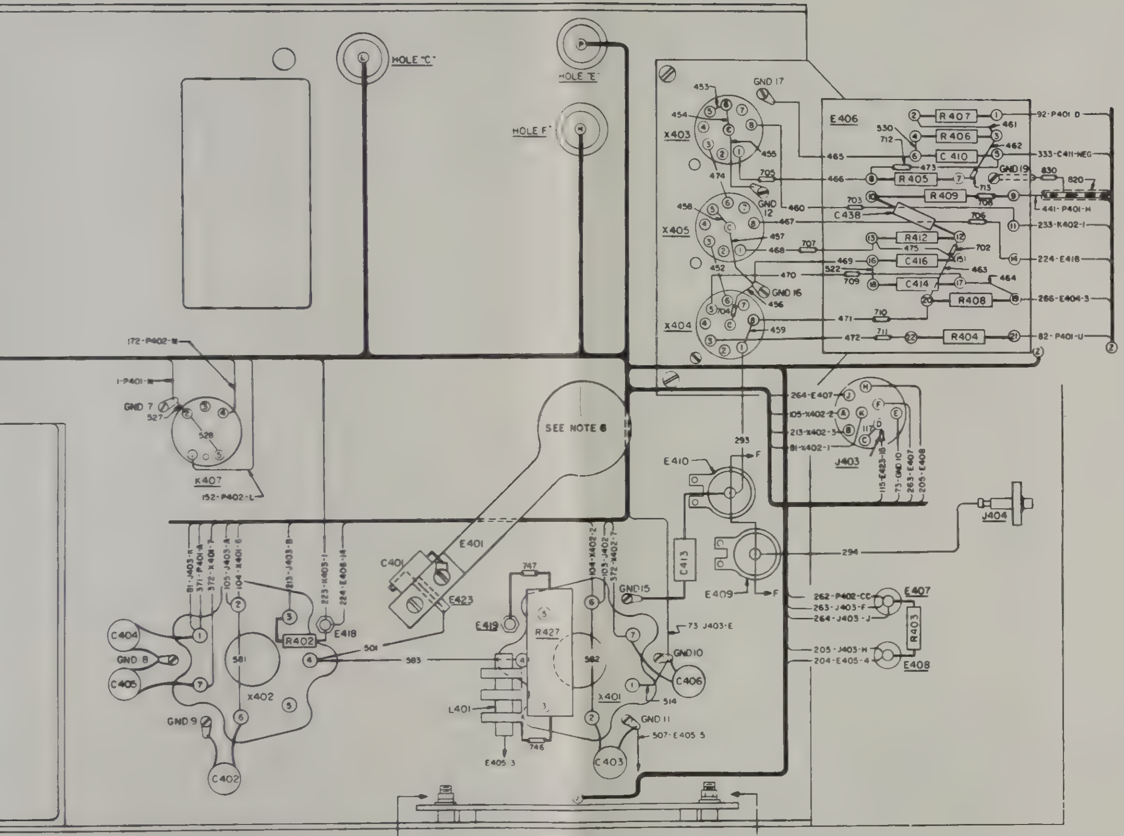
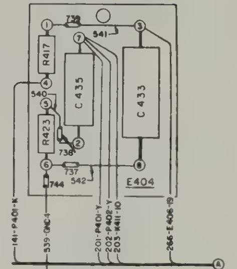

E404
SEE VIEW "D-D"
E423
R415
R426
R429
C418
C420
R413
R416
C422
C412
R410
R411
C417
C421
R419
R414
C432
C436
K403
K402
K405
K411
K404
K409
K410
K406
R418
HOLE "A"
E422
GND 18
HOLE "B"
P402
SEE VIEW "A-A"
P401
SEE VIEW "B-B"
E417
HOLE "C"
HOLE "E"
HOLE "F"
HOLE "D"
B401
K407
SEE NOTE 6
E401
C401
E423
E419
R427
E418
R402
X402
J401
C402
C403
C404
C405
C406
L401
GND 8
GND 9
GND 10
GND 11
GND 15
E405
SEE VIEW "E-E"
E406
X403
X405
X404
R407
R406
C410
R405
R409
C438
R412
C416
C414
R408
R404
J403
J404
E410
E409
C415
E407
R403
E408
R417
R423
C435
C433
E404
VIEW AT "D-D"
C407
R401
E405
VIEW AT "E-E"
P401
VIEW AT "B-B"
P402
VIEW AT "A-A"
VIEW AT "K-K"
HOLE E
HOLE F
O402
O404
O403
E420
VIEW "J-J"
E416
E415
E409
VIEW AT "F-F"

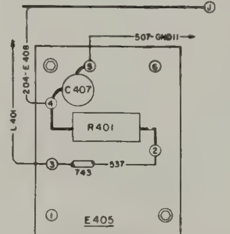
Figure 24-4. M1 Amplifier, Radio Frequency AM-774A/ARC-21, Connection Diagram


HOLE "C"
HOLE "E"
HOLE "F"
E406
R407
R406
C410
R405
R409
C438
R412
C416
C414
R408
R404
X403
X405
X404
J403
E410
E409
J404
E407
R403
E408
C401
E401
E423
R402
E418
C404
C405
C402
X402
L401
R427
C406
C403
X401
K407
SEE NOTE 6

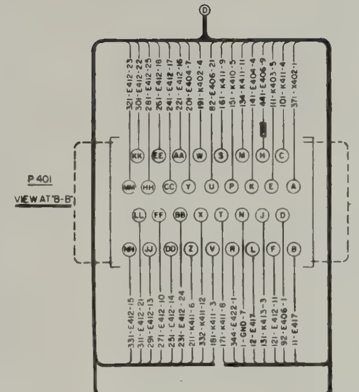
E405
SEE VIEW "E-E"

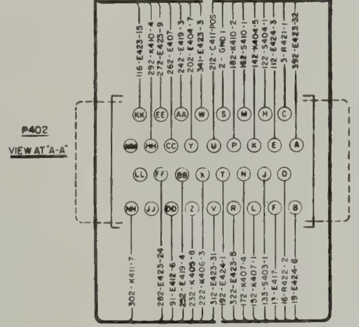

R417
R423
C435
C433
E404

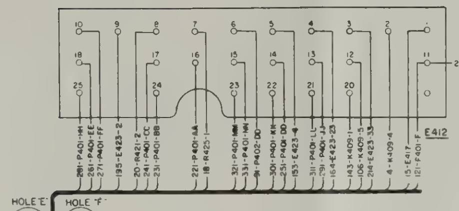
VIEW AT 'D-D'


C407
R401
E405

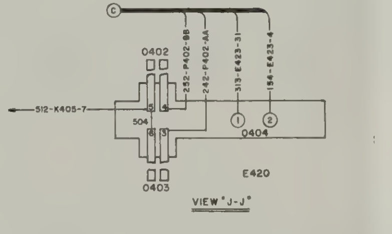
VIEW AT 'E-E'


P401
VIEW AT 'B-B'

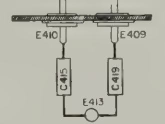

P402
VIEW AT 'A-A'


E412
HOLE 'E'
HOLE 'F'

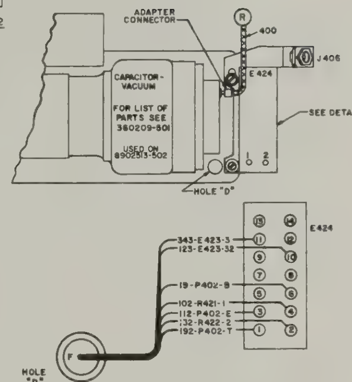
VIEW AT "K-K"


0402
0403
0404
E420

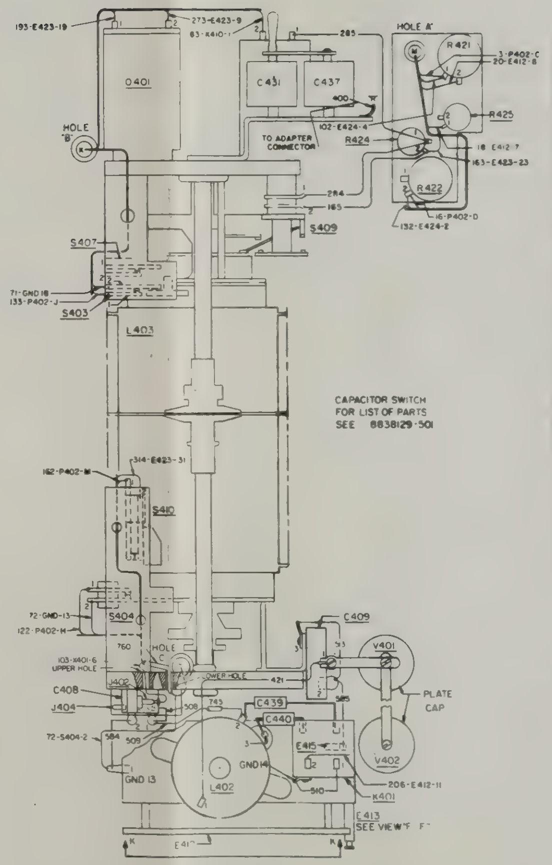
VIEW "J-J"


E410
E409
C415
C419
E413

VIEW AT "F-F"


ADAPTER CONNECTOR
CAPACITOR-VACUUM
FOR LIST OF PARTS SEE 360209-501
USED ON 8902513-501
J405
E424
SEE DETAIL "B"
HOLE "D"
HOLE "D"

DETAIL "B"


HOLE 'A'
R421
R425
R424
R422
C401
C431
C437
TO ADAPTER CONNECTOR
HOLE 'B'
S407
S409
S403
L403
S410
S404
C408
J404
C409
V401
V402
PLATE CAP
C439
C440
L402
E413
SEE VIEW "F-F"
CAPACITOR SWITCH
FOR LIST OF PARTS
SEE 8838129-501

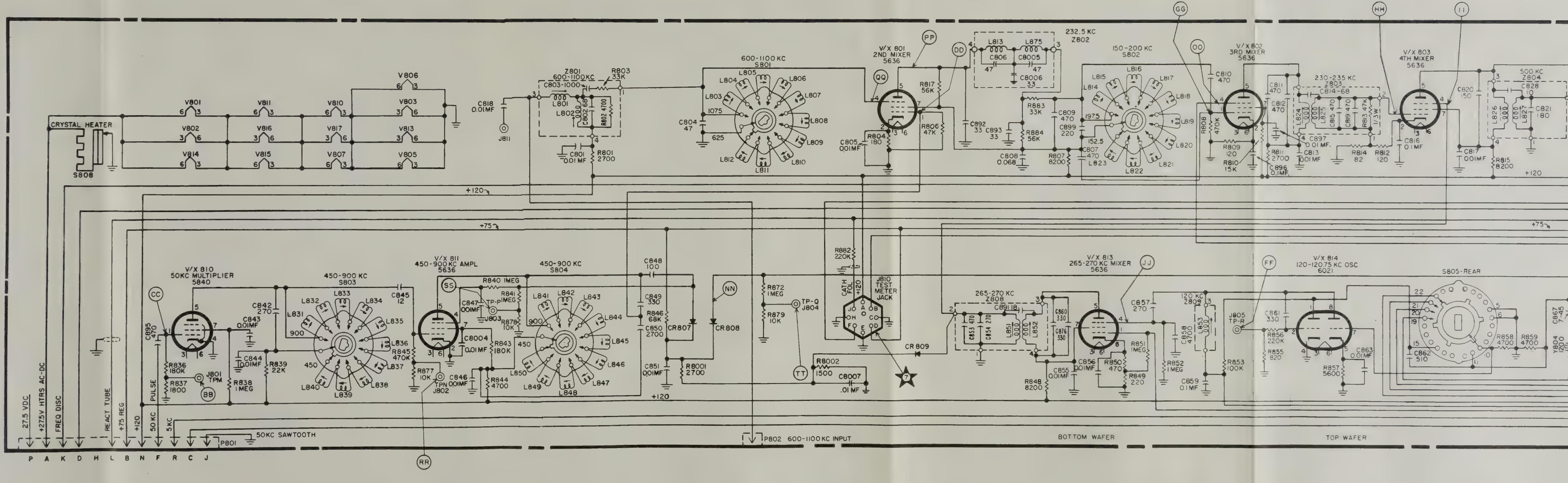
WIRE TABLE	
WIRE NO INCLUSIVE	DESCRIPTION COLOR AND CONDUCTOR
1 4	WIRE WHT RED BLU TR AWG 20 600V
1 2	RED TR AWG 20
71 74	BLK AWG 24
81 82	BRN
91 94	RED
101 106	ORN
111 117	YEL
121 125	GRN
131 134	BLU TR
141 143	BLK/GRN TR
151-154	BLK/RED
161-165	BLK/GRN
171-172	BRN/RED
181-184	BRN/GRN
191 195	BRN/BLU
201 206	RED/BLK
211-215	RED/GRN
221-224	RED/BLU
231 233	YEL/BLK
241 243	YEL/GRN
251-253	YEL/RED
261-266	GRN/BLK
271 273	GRN/BRN
281-285	GRN/RED
291-294	BLU/BRN
301-302	WHT BLU/BLK TR
311 314	RED
321-323	GREEN
331 333	YELLOW
341 345	BLUE AWG 24
36	WHT BLU TR AWG 18
371 372	WHT BRN TR AWG 18
391 392	WIRE WHT GRN TR AWG 18 600V
400	CONNECTOR LINK
421	WIRE WHT ORN AWG 20 600V
441	CABLE SHIELDED WHT AWG 24 600V
452 475	WIRE TINNED COPPER 0159 DIA
501 545	WIRE TINNED COPPER 0320 DIA
581 585	WIRE TINNED COPPER 0402 DIA
702 713	SLEEVING INSUL BLK 022 ID
820	SLEEVING INSUL BLK 085 ID
830	SLEEVING INSUL BLK 33 ID
731-752	SLEEVING INSUL BLK 042 ID
760	SLEEVING INSUL TRANS 166 ID
812	SLEEVING INSUL BLK 076 ID

NOTES:

1. E 401 (SPRING) CONTACTS PLATE CAPS OF V512 & V513 ON PERM. TUNER CHASSIS.
2. DRAWING CONTAINS INFORMATION FOR USE WITH VACUUM CAPACITOR ASSEMBLY 360209-501. FOR UNITS USING OIL CAPACITOR ASSEMBLY 8838312-501 (SEE DETAIL "A"). THE FOLLOWING WIRING CHANGES ARE TO BE MADE:

CONNECT WIRE	BETWEEN	
195	E412-9 & E423 3	
524 & 735	E423-2 & E423-29	
503 & 741	R421-2 & R425-2	SEE NOTE 3
502 & 740	R422-1 & R425-1	
400	C431-C437 & E421	SEE DETAIL "A"
192	P402-T & S408-2	
343	E423-3 & E416-1	
123	E423-32 & E416-2	
19	P402-B & E416-3	
112	P402 E & E416 4	
102	R425 1 & E416 5	
32	R422 2 & E416-6	
REMOVE ½" FROM WIRE #400		

3. WIRES 502, 503, 740 & 741 ARE ISSUED ON 8902513-501 ONLY (P.A. WITH OIL CAPACITOR)



CRYSTAL HEATER
S808
V801 V811 V810 V806 V803 V802 V816 V817 V813 V814 V815 V807 V805
Z801 600-1100KC
C803-1000
R803 33K
C818 0.01MF
J811
L801 L802 C802 68 R802 4700
C801 .01MF
R801 2700
+120
+75
600-1100 KC S801
L803 L804 L805 L806 L807 L808 L809 L810 L811 L812
C804 47
1075
625
V/X 801 2ND MIXER 5636
PP QQ DD
R817 56K
R804 180
C805 .001MF
R806 47K
232.5 KC Z802
L813 L875 C806 C8005 47 47 C8006 33
C892 33 C893 33
R883 33K R884 56K
C808 0.068
C809 470 C899 220
R807 8200
C807 470
150-200 KC S802
L814 L815 L816 L817 L818 L819 L820 L821 L822 L823
1975 152.5
GG OO HH II
V/X 802 3RD MIXER 5636
C810 470
R808 470K
R809 120 R810 15K
C811 470 C812 470
230-235 KC Z803 C814-68
L824 L825 470 C819 470 R813 47K 1/2W
C897 0.01MF
R811 2700 C813 .001MF C896 0.1MF
R814 82 R812 120
V/X 803 4TH MIXER 5636
C820 150
C816 0.1MF
C817 .001MF
R815 8200
500 KC Z804 C828 L826 L827 C821 180
+120 +75
V/X 810 50KC MULTIPLIER 5840
CC
C895 470
R836 180K R837 1800
J801 TPM BB
C842 270 C843 .001MF
C844 .001MF
R838 1MEG R839 22K
450-900 KC S803
L831 L832 L833 L834 L835 L836 L837 L838 L839 L840
900 450
C845 12
R845 470K
V/X 811 450-900 KC AMPL 5636
SS
R840 1MEG R841 1MEG
C847 .001MF TP-P J803
R878 10K R843 180K
C8004 .01MF
R877 10K TPN J802
C846 .001MF R844 4700
RR
450-900 KC S804
L841 L842 L843 L844 L845 L846 L847 L848 L849 L850
900 450
C848 100
C849 330
R846 68K
C850 2700
C851 .001MF
CR807 CR808 NN
R8001 2700
+120
R872 1MEG R879 10K
TP-Q J804
TT
R8002 1500 C8007 .01MF
R882 220K
CATH FOL +120
J810 TEST METER JACK
J A B H K C F E D
7
CR809
265-270 KC Z808
C853 110 C854 270 C891 18 L851 L852
C860 330 C876 330
V/X 813 265-270 KC MIXER 5636
JJ
C857 270
R851 1MEG
C856 .001MF R850 470 R849 220
C855 0.01MF R848 8200
C858 4700 120 KC Z809 L853
R852 1MEG
C859 0.1MF
FF
J805 TP-R
R853 100K
C861 330 R856 220K R855 820
V/X 814 120-120.75 KC OSC 6021
R857 5600 C863 0.01MF
S805-REAR
C862 510
R858 4700 R859 4700
C867 Y804
27.5 VDC
+275V HTRS AC-DC
FREQ DISC
REACT TUBE
+75 REG
+120
PULSE
50 KC
5KC
50KC SAWTOOTH
P801
P802 600-1100KC INPUT
BOTTOM WAFER
TOP WAFER
P A K D H L B N F R C J

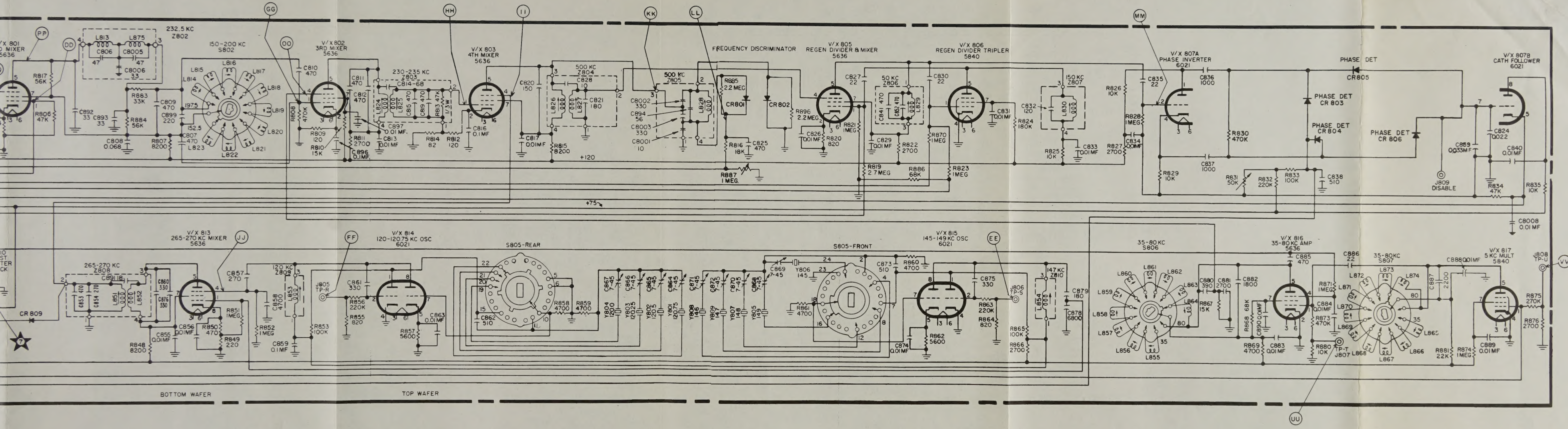

V/X 801
3RD MIXER
5636
232.5 KC
Z802
150-200 KC
S802
V/X 802
3RD MIXER
5636
230-235 KC
Z803
V/X 803
4TH MIXER
5636
500 KC
Z804
FREQUENCY DISCRIMINATOR
500 KC
Z805
V/X 805
REGEN DIVIDER & MIXER
5636
50 KC
Z806
V/X 806
REGEN DIVIDER TRIPLER
5840
150 KC
Z807
V/X 807A
PHASE INVERTER
6021
PHASE DET
CR805
PHASE DET
CR 803
PHASE DET
CR 804
PHASE DET
CR 806
V/X 807B
CATH FOLLOWER
6021
J809
DISABLE
+120
+75
V/X 813
265-270 KC MIXER
5636
265-270 KC
Z808
CR 809
120 KC
Z809
J805
TP-R
V/X 814
120-120.75 KC OSC
6021
S805-REAR
S805-FRONT
V/X 815
145-149 KC OSC
6021
J806
TP-S
147 KC
Z810
35-80 KC
S806
V/X 816
35-80 KC AMP
5636
35-80 KC
S807
J807
TP-T
V/X 817
5 KC MULT
5840
J808
TP-U
BOTTOM WAFER
TOP WAFER
GG
HH
II
KK
LL
MM
PP
DD
OO
JJ
FF
EE
VV
UU
7

Figure 24-5. M1 Amplifier-Filter Assembly AM-775A/ARC-21, Schematic Diagram

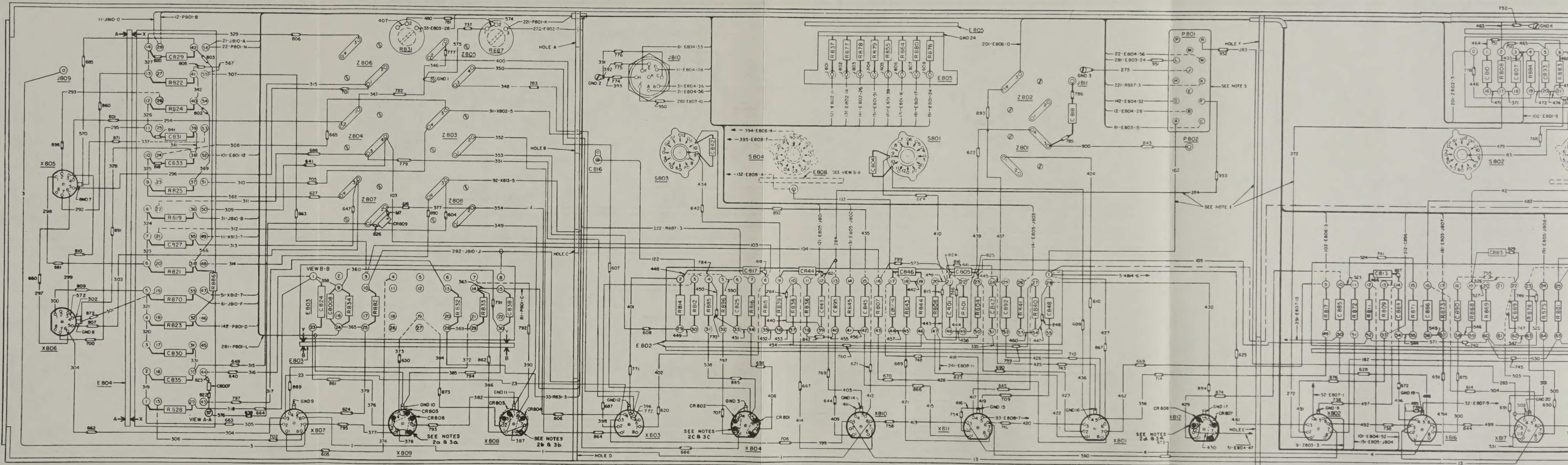
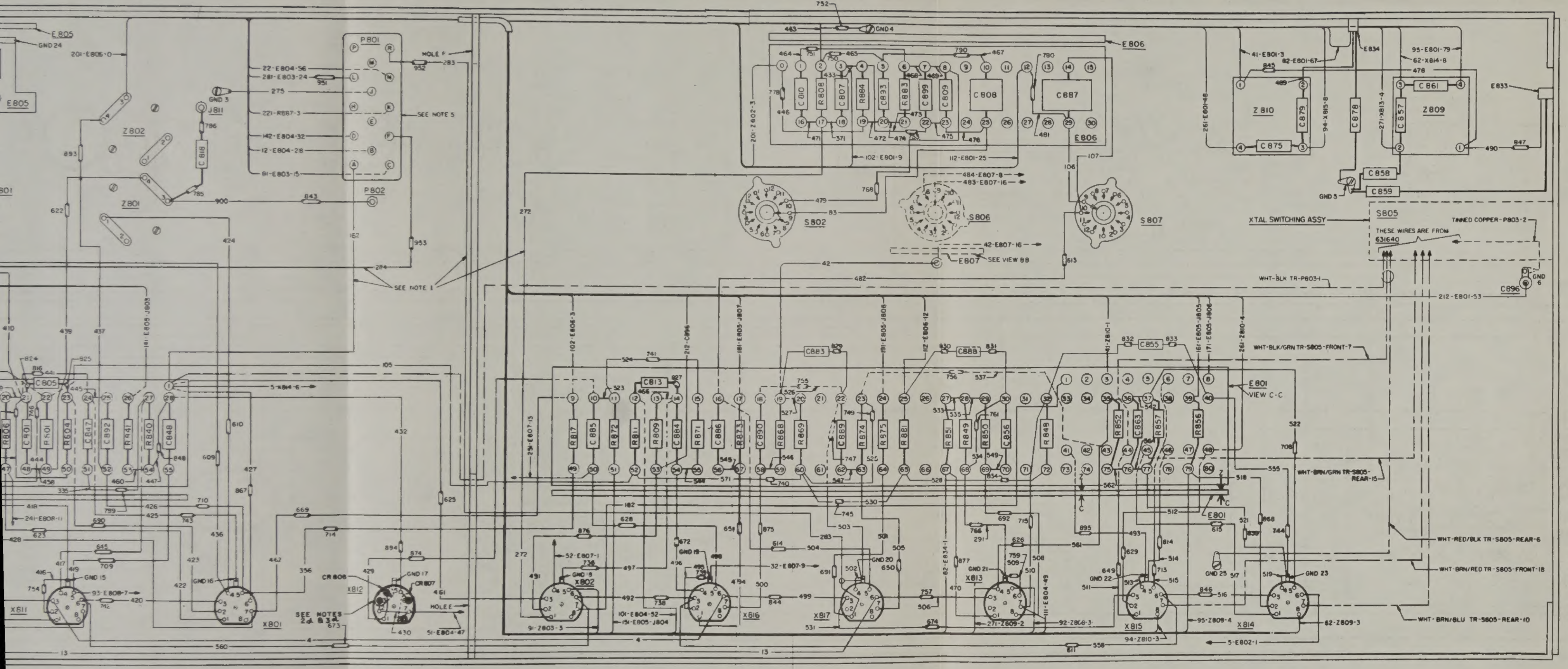
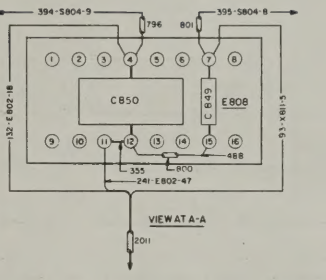
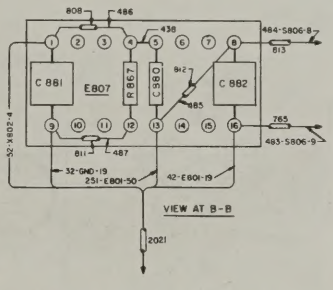

J809
X805
X806
E804
VIEW A-A
VIEW B-B
E803
X807
X808
X809
SEE NOTES 2a & 3a
SEE NOTES 2b & 3b
Z806
Z805
Z804
Z803
Z807
Z808
R831
R867
HOLE A
HOLE B
HOLE C
HOLE D
C816
J810
S803
S804
E808
E802
X803
SEE NOTES 2C & 3C
X804
X810
X811
E805
S801
Z802
Z801
J811
P801
P802
SEE NOTE 5
SEE NOTE 1
X801
SEE NOTES 2d & 3d
X812
X802
X816
X817
S802

Figure 24-6. M1 Amplifier-Filter Assembly AM-775A/ARC-21, Connection Diagram

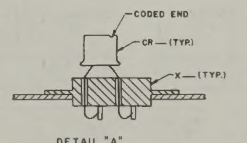

P801
P802
Z802
Z801
J811
X811
X801
X802
X816
X817
X813
X815
X814
X812
CR808
CR807
S802
S806
S807
S805
E801
E805
E806
E807
XTAL SWITCHING ASSY
THESE WIRES ARE FROM 631640
TINNED COPPER · P803-2
SEE NOTE 1
SEE NOTE 5
SEE VIEW BB
VIEW C-C
SEE NOTES 2d & 3
HOLE F
HOLE E
WHT-BLK TR-P803-1
WHT-BLK/GRN TR-S805-FRONT-7
WHT-BRN/GRN TR-S805-REAR-15
WHT-RED/BLK TR-S805-REAR-6
WHT-BRN/RED TR-S805-FRONT-18
WHT-BRN/BLU TR-S805-REAR-10
Z810
Z809



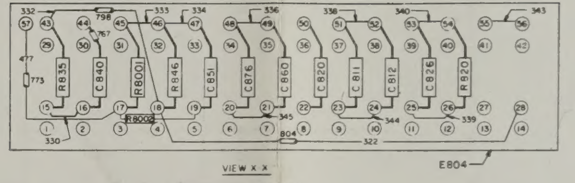
VIEW AT A-A


C881
E807
R867
C880
C882

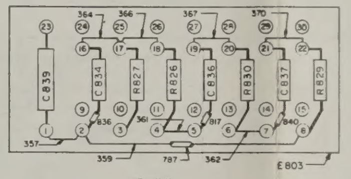
VIEW AT B-B


CODED END
CR — (TYP)
X — (TYP)

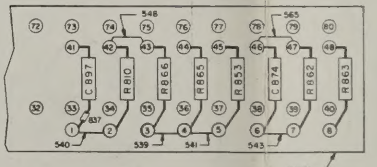
DETAIL "A"



VIEW X-X
ROTATED 90° CLOCKWISE



VIEW Y-Y



VIEW Z-Z

WIRE TABLE	
WIRE NO'S INCLUSIVE	DESCRIPTION WIRE AND CONDUCTOR
1-5	WIRE WHITE BRN TR AWG 24 600V
11-13	BLK/BRN TR
21-23	BRN/RED TR
31-33	BLK/GRN TR
41-42	BRN/GRN TR
51-52	YEL TR
61-62	BRN/BLU TR
81-83	RED/GRN TR
91-95	BLU TR
101-107	RED/BLU TR
111-112	YEL/BLK TR
121-122	YEL/RED TR
131-132	YEL/GRN TR
141-142	GRN/BLK TR
151	GRN/BRN TR
161-162	GRN/RED TR
171	BLU/BRN TR
181-182	BLU/BLK TR
191	BRN/ORN TR
201	BRN/YEL TR
212	RED TR
221-222	YEL/BLU TR
241	GRN/ORN TR
251	GRN/YEL TR
261	ORN TR
271-272	GRN TR
275	WIRE WHITE BLK TR AWG 24 600V
281 284	WIRE WHITE BRAIDED
291-577	WIRE TINNED COPPER .0159 DIA.
601-617	SLEEVING INSUL BRN .052 O.D
620-630	RED
640 651	YEL
660-674	BLU
685-692	VIO
710-715	GRN
736-848	BLK
860-877	WHT
830-896	SLEEVING INSUL GRY .052 O.D
900	CABLE
950-953	SLEEVING INSUL BLK .066 I.D
2011	SLEEVING INSUL BLK .106 I.D
2021	SLEEVING INSUL BLK .133 I.D

NOTES

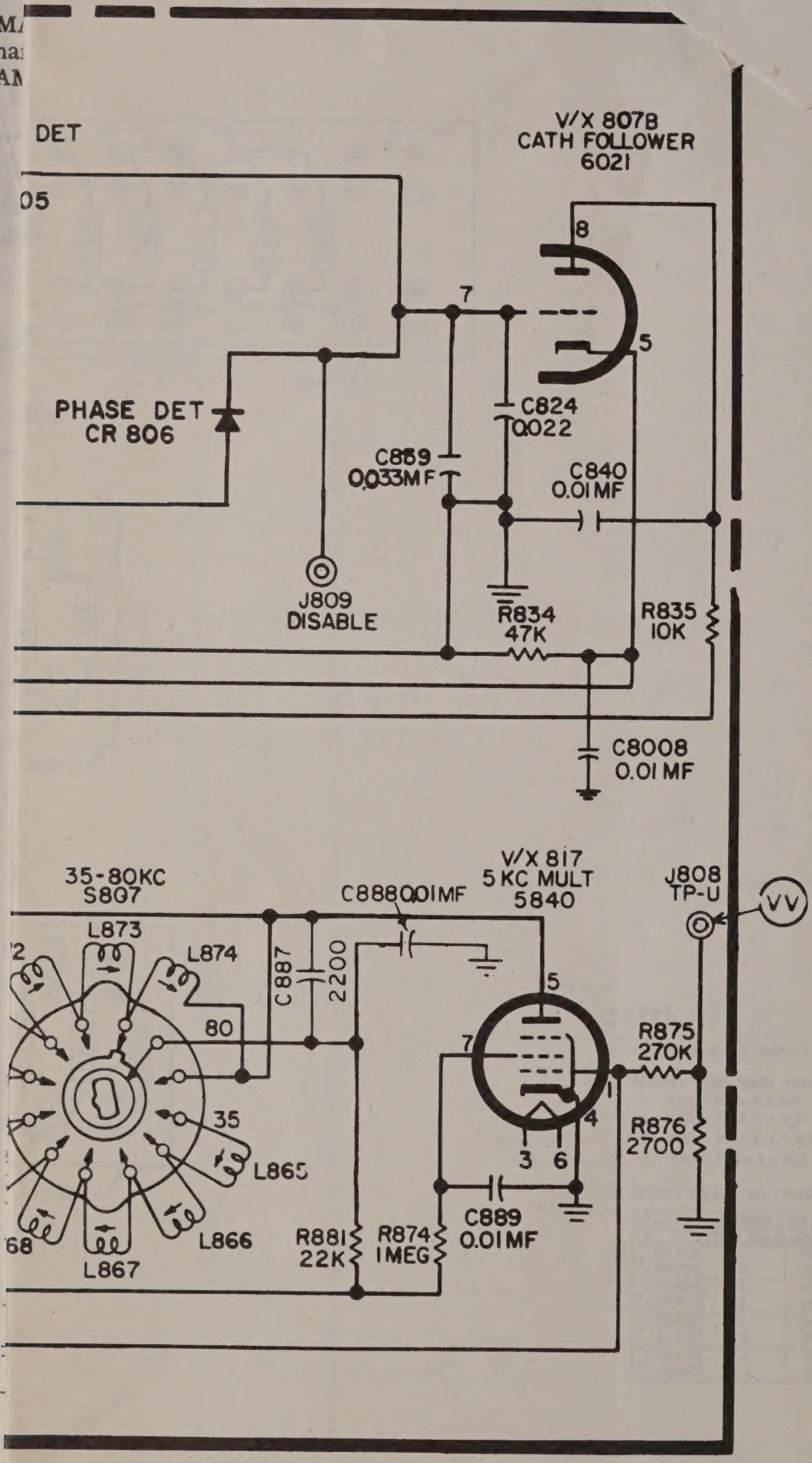
1. RUN THESE WIRES OUTSIDE OF CABLE.
2. REMOVE PINS FROM TUBE SOCKETS AS FOLLOWS:
   - a X809: PINS 3,5,6,8
   - b X808: PINS 3,4,6,8
   - c X804: PINS 2,3,4,6,8
   - d X812: PINS 3,4,6,8
3. MOUNT CR801 TO CR808 AS INDICATED IN DETAIL "A" AND CONNECT AS FOLLOWS:

☒	CR___	CODED END LEAD		UNCODED END LEAD	
		THRU HOLE	SOLDER TO	THRU HOLE	SOLDER TO
a	CR805 CR806	3 6	PIN 2 PIN 7	5 8	PIN 4 PIN 1
b	CR803 CR804	4 6	PIN 1 PIN 5	3 8	PIN 2 PIN 7
c	CR802 CR801	2 6	PIN 1 PIN 5	3 8	GND 13 PIN 7
d	CR808 CR807	4 6	PIN 1 PIN 5	3 8	PIN 2 PIN 7

Se
Di

br

M/
na
AN


DET
05
V/X 807B
CATH FOLLOWER
6021
8
7
5
PHASE DET
CR 806
C824
0.022
C889
0.033MF
C840
0.01 MF
J809
DISABLE
R834
47K
R835
10K
C8008
0.01 MF
35-80KC
S807
L873
L874
C888 0.01MF
V/X 817
5 KC MULT
5840
J808
TP-U
VV
C887
2200
80
35
L865
L866
L867
68
R875
270K
R876
2700
R881
22K
R874
1MEG
C889
0.01MF
7
5
1
4
3
6

lter Assembly AM-775A/ARC-21, Schematic Diagram

WIRE TABLE	
NO'S SIVE	DESCRIPTION WIRE AND CONDUCTOR
	WIRE WHITE BRN TR AWG 24 600V
	BLK/BRN TR
	BRN/RED TR
	BLK/GRN TR
	BRN/GRN TR
	YEL TR
	BRN/BLU TR
	RED/GRN TR
	BLU TR
7	RED/BLU TR
	YEL/BLK TR
2	YEL/RED TR
	YEL/GRN TR
2	GRN/BLK TR
	GRN/BRN TR
2	GRN/RED TR
	BLU/BRN TR
	BLU/BLK TR
	BRN/ORN TR
	BRN/YEL TR
	RED TR
2	YEL/BLU TR
	GRN/ORN TR
	GRN/YEL TR
	ORN TR
2	GRN TR
	WIRE WHITE BLK TR AWG 24 600V
4	WIRE WHITE BRAIDED
7	WIRE TINNED COPPER .0159 DIA.
7	SLEEVING INSUL BRN .052 O.D
30	RED
51	YEL
74	BLU
92	VIO
15	GRN
48	PLK
77	WHT
96	SLEEVING INSUL GRY .052 O.D
	CABLE
53	SLEEVING INSUL BLK .066 I.D
	SLEEVING INSUL BLK .106 I.D
	SLEEVING INSUL BLK .133 I.D

S FOLLOWS:

ED IN DETAIL "A" AND CONNECT AS FOLLOWS:

ODED END LEAD	
HOLE	SOLDER TO
	PIN 4 PIN 1
	PIN 2 PIN 7
	GND 13 PIN 7
	PIN 2 PIN 7